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Deus Damian Komba
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Risk judgement, Risk taking behaviour and Road Traffic Accidents in Tanzania

Geographical Analysis

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Thesis for the Degree of
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ABSTRACT

Urban road traffic and driving culture in Tanzania is partly characterised by low level of safety behaviour, arrogant attitude, under-aged driving, and unlicensed drivers. Such drivers are reported to be more reckless, non-cautious and inconsiderate to other road users. A serious problem experienced in urbanised areas is the chaotic and jumbled manner of the motorcyclists who ride in a scattered form on every lane on the road. Risk source from road traffic accidents is perceived to be very low and the degree of willingness to reduce the magnitude of effect from road traffic accidents is also very low. The probabilities of experiencing fatal road traffic accident is higher in rural areas than in urban areas. Mitigation measures for reducing such risk taking behaviour are not readily available in the country.

The present study has investigated; 1) the underlying pattern and tendencies of risk perception, risk attitudes, risk willingness and risk taking behaviour of Tanzanian public on road traffic by geographical areas (i.e. urban, semi urban and rural), by gender division (i.e. males and females) and by relevant age groups based on driving experience or likely risk taking behaviour. 2) The important factors contributing to risk taking behaviour of Tanzanian public on road traffic when experiencing different levels of system risk (i.e. urban, semi-urban and rural traffic), and 3) the extent such factors are attributed to contextual conditions in each type of geographical area and to compositional condition.

Four theoretical approaches with relevance to geographical perspectives were used: 1) system approach guided by a model for safe traffic system, 2) risk theory and cultural approach, 3) political ecology approach and 4) modernization approach. The methodology of the study was based on triangulation approach. Data collection methods involved a questionnaire survey, interviews, focus group discussion and observation. In the analysis; 1) the reliability and the validity of the measure instrument in a survey data were examined by a set of statistical techniques; this included exploratory factor analysis. 2) Both MANOVA and ANOVA, along with descriptive statistics and post-hoc test were used to compare means of risk perception, risk attitude, risk willingness and risk taking behaviour by geographical areas, gender and age group. 3) Step wise linear regression analysis was used to select the best-fit model in explaining risk-taking behaviour of Tanzanian public on traffic. 4) A four-step data analytic method by Baron and Kenny (1986) was used to examine mediation effect underlying an observed relationship between religious belief and risk taking behaviour. 5) Contextual as well as content analysis techniques were used to analyse the transcribed interviews with lay people as well as experts and other key informants.

The results revealed that; People living in urban and semi-urban areas perceive lower risk of man-made related dangers associated with road traffic accidents than those living in rural areas. The attitude towards rule violation is higher in rural areas than in urban and semi-urban areas. The tendency of over speeding and risk driving is higher in rural areas and it indicates to be slightly lower in semi-urban and urban areas. 36.8% of the variance in risk taking behaviour associated with road traffic accidents is explained by the contribution of 1) risk attitude, 2) religious belief, 3) risk willingness and 4) geographical area. The factor religious belief had a greater effect on risk taking behaviour compared to other explanatory factors. Males were more visible on traffic related risk than females. In general, the problem of road accident risk and hazardous behaviour implicates both compositional and contextual features embedded in the country.

A number of countermeasures targeting road user behaviour are recommended. The overall conclusion is that, the geographical context of urban-rural difference in Tanzania plays a significant role in analysing road user behaviour. Road users in Tanzania perform or reproduce behaviours that are themselves a product of the relationship between their local environment and traffic related technology in traffic system that surrounds them. Geographical spaces of culturally related beliefs are significant predictors of driving behaviour in Tanzania. The likelihood for an individual or a group to engage in risky or safety behaviour on road traffic is largely predicted by belief related factors in Tanzania.

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Dedication

The encouragement and the support from my family has always been with me throughout my studies. This thesis is dedicated to beloved wife Lucy Pius Kyauke and my lovely children Sweetbert, Lynn-Vanessa and Liv-Theresa. I can say, Lucy is indeed, typical of the strong lady behind her partner's success

Table of Contents

List of figure

List of tables

Vocabulary and acronyms

- ANOVA – Analysis of Variance
- ARC – Annual Roads Convention
- BAKITA – Baraza la Kiswahili Tanzania
- BICO – The Bureau for Industrial Cooperation, University of Dar es Salaam
- BTD – British Transport Department
- CBO – Community Based Organisation
- CHR – Commonwealth Human Right Organisation
- COSTECH – Commission of Science and Technology in Tanzania
- CSA – Council of Scientific Affairs
- DALY – Disability Adjusted Life Year
- DFID – Department For International Development
- DVELA – Driver and Vehicle Examination and Licensing Agency
- ECA – Economic Commission For Africa
- FGD – Focus Group Discussion
- GDP – Gross Domestic Product
- HIC – High Income Countries
- IRF – International Religious Forum
- ITF – International Forum
- LHRC – Legal and Human Right Centre
- LIC – Low Income Countries
- LRSA – Lead Road Safety Agency
- MANOVA- Multivariate analysis of variance
- MoT – Ministry of Transport
- NGO – Non Governmental Organisations
- NIT – National Institute of Transportation
- NRSA – National Road Safety Authority
- NRSC – National Road Safety Policy
- NRSP – National Road Safety Policy
- NS – Not Significant
- NTNU – Norwegian University of Science and Technology
- NTP – National Transport Policy
- OECD – Organisation For Economic Cooperation and Development
- PF3 – Police Form
- PLO – Principal Component Analysis
- PO-LGA – Prime Minister Office – Local Government Authority
- P-Value – A probability of obtaining a test statistics at least as extreme as the one that was observed
- RCT – Risk Compensation Theory
- RDP – Rural Development Policy
- RHT – Risk Homeostasis Theory
- SADC – Southern African Developing Countries
- SPSS – Statistical Package for the Social Science
- SUMATRA – Surface and Marine Transport Authority.
- TANGO – Tanzania Non-Governmental Organisation
- TANROADS – Tanzania National Roads Agency
- TARA – Tanzania Road Association
- TIE – Tanzania Institute of Education
- TRA – Tanzania Revenue Authority
- UDSM – University of Dar es Salaam
- UNESCO – The United Nations Educational, Scientific and Cultural Organization
- URT – United Republic of Tanzania
- WHO – World Health Organisation

CHAPTER ONE

Introduction aims and background of the problem

1.0 Introduction

Road traffic accidents are disproportionally distributed both between urban and rural areas within the countries and across high income and low-income countries (Vasconcellos, 2001; Nordfjærn et al, 2011; WHO, 2013). These redistributions disfavour people in rural settlements and low income countries, because individual allocated in these context have higher probability of experiencing road traffic accidents than people in urban settlements and high-income countries (Nordfjærn et al, 2011). The probabilities of experiencing fatal road traffic accident is higher in rural areas than in urban areas (Jones et al. 2007). There are generally fewer fatal road traffic accidents in urbanised compared to rural. Urban areas have a higher frequency of smaller accidents resulting into vehicle damages and less severe person injuries (Eiksund, 2009).

These differences could be attributed due to differences in the physical traffic environment across rural and urban areas such as the road network or number of vehicles (Jones, 2007). It could be differences in safety culture across urban-rural areas such as traffic control, reinforcement mechanisms or safety values (Rakauskas et al. 2007). It could be due to differences on how people at different type of geographical areas perceive and interpret risk related to road traffic accidents (Nordfjærn et al, 2011). It could be due to diverging demographic composition in these geographical areas, because, studies from traffic psychology, indicate that, differences in the composition of demographic characteristics within geographical areas may also contribute to individual differences in risk perception, risk attitudes, risk willingness and risk taking behaviour associated with road traffic accidents (Iversen & Rundmo, 2004; Rundmo & Moen, 2006). Such human factors have also been investigated across different countries (Nordfjærn & Rundmo, 2009; Nordfjærn et al, 2011). However, few studies have considered such factors when examining road accident risk in urban, semi-urban and rural areas within specific countries.

Since people are different and they react differently to different traffic related events, the challenge is to find what is shared amongst individuals about their subjective reality and draw some conclusions relevant to suggest appropriate road safety measures that fit their traffic environment

(WHO, 2013). Such a challenge is found to be more peculiar in low-income countries where most imposed road safety measures have not significantly reduced the magnitude of road accident risk (Tiwari et al., 1998; Jacobs 2000; Peden et al., 2001; WHO, 2009, 2013).

In Tanzania for instance, road safety campaigns have been always focused upon the entire population (Massaoe, 2007) and have not been effective in changing hazardous behaviour of the Tanzanian public in traffic (Police report, 2010). Road safety campaigns in Tanzania could probably be more likely to succeed if they are directed at local communities, specific type of geographical area, or specific age groups of the same behaviour pattern.

Hence, the present study is aimed to uncover; 1) the underlying pattern and tendencies of risk perception, risk attitudes, risk willingness and risk taking behaviour of the Tanzanian public in traffic by geographical areas (i.e. urban, semi urban and rural), by gender division (i.e. males and females) and by relevant age groups of likely behaviour. 2) The important factors contributing to risk taking behaviour of the Tanzanian public in road traffic when experiencing different levels of system risk (i.e. urban, semi-urban and rural traffic);3) The extent such factors are attributed to contextual conditions in each type of geographical area and to compositional condition.

This stratified analysis intends specifically to provide information that can contribute to the scope for improving road safety through the interplay between aspects of road traffic system and micro-level focus of road user behaviour. From a geographical perspective, system is referred as a group of elements organised such that each one is in some way interdependent either directly or indirectly with every other element (Bennett & Chorley, 1978; Johnstone, 2009). Road traffic system has a substantial link with environment factor (comprising the roads and the wider physical and built up environment). Vehicle factor (comprising of the volume and quality of vehicles operating in a place) and human behaviour factor (comprising demographic characteristics, perception, attitude, driving behaviour, driving style and driving experience) (Bennett & Chorley, 1978; Mikkonen, 1997; OECD, 1997; Jørgensen & Abane, 1999). The micro-level focus of road user behaviour is to approach human behaviour in a reduced scale of relevant construct factors (i.e. perception, attitudes or willingness).

1.1 Background of the problem

Risk source from road traffic accidents is alarming worldwide. Over 1.2 million people die each year on the world's roads, and between 20 and 50 million suffer from non-fatal injuries (WHO, 2009). This represents an average of 3,242 persons dying each day around the world from road traffic injuries (Murray et al., 2012). According to the WHO report (2013), for a period of five years (2007 to 2012), there has been no overall reduction in the number of people killed on the world's roads. A projection of the leading cause of death by WHO (2004) indicates that; road traffic accidents were the ninth leading cause of death globally, and will rise to become the fifth leading cause of death by 2030 (WHO, 2004; WHO, 2009).

Table 1.1 Projection of leading cause of death 2004 and 2030 worldwide

LEADING CAUSE OF DEATH 2004		LEADING CAUSE OF DEATH 2030	
1	Ischaemic heart disease	1	Ischaemic heart disease
2	Stroke	2	Cerebrovascular disease
3	Lower respiratory infections	3	Chronic obstructive pulmonary disease
4	Chronic obstructive pulmonary disease	4	Lower respiratory infections
5	Diarrhoeal diseases	**5**	**Road traffic injuries**
6	HIV/AIDS	6	Trachea, bronchus, lung cancers
7	Trachea, bronchus, lung cancers	7	Diabetes mellitus
8	Diabetes mellitus	8	Hypertensive heart disease
9	**Road traffic injuries**	9	Stomach cancer
10	Prematurity and low birth weight	10	HIV/AIDS

Source *W.H.O. (2004 & 2009).*

The leading causes of death (see table 1.1) are dominated by non-communicable conditions including road traffic accidents. Large declines in mortality between 2004 and 2030 are projected for all of the principal communicable, maternal, perinatal and nutritional causes, including HIV/AIDS, TB and malaria. The projected 28% increase in global deaths due to injury between 2004 and 2030 is predominantly due to the increasing number of road accident fatalities (Mathers & Loncar, 2006).

A projection through a measure of an overall disease burden, expressed as the number of years lost due to ill-health or disability, (DALY) by WHO (2004), indicates that: Road traffic injuries were

the ninth leading cause of disability and adjusted life year lost globally, and will rise to become the third leading cause of disability and adjusted life year lost by 2030 (WHO, 2004; WHO, 2009).

Table 1.2 Projection of leading cause of disease burden or injury 2004 and 2030 worldwide

	LEADING CAUSE OF DISEASE BURDEN OR INJURY 2004		LEADING CAUSE OF DISEASE BURDEN OR INJURY 2030
1	Lower respiratory infections	1	Unipolar depressive disorders
2	Diarrhoeal diseases	2	Ischaemic heart disease
3	Unipolar depressive disorders	3	**Road traffic injuries**
4	Ischaemic heart disease	4	Cerebrovascular disease
5	HIV/AIDS	**5**	Chronic obstructive pulmonary disease
6	Cerebrovascular disease	6	Lower respiratory infections
7	Prematurity and low birth weight	7	Hearing loss, adult onset
8	Birth asphyxia and birth trauma	8	Refractive errors
9	**Road traffic injuries**	9	HIV/AIDS
10	Neonatal infections	10	Diabetes mellitus

Source *W.H.O. (2004 & 2009).*

Both predictions for the leading cause of death in table 1.1 and the DALY's in table 1.2 consider that; economic development is one of the main determinant factors for the changing patterns of mortality and disease burden over a period of time (Murray & Lopez, 1996; Van Beek et al. 2000; Kopits & Cropper, 2005; Mathers & Loncar, 2006; OECD, 2010). The assumption is; rising of living standards in a population will make a major contribution to the transition, from a cause of death pattern dominated by infectious diseases with very high mortality to a pattern dominated by chronic disease with lower mortality (Murray & Lopez, 1996; Mathers & Loncar, 2006; WHO 2009).

General evidence shows that economic growth is associated with improvements in the health services of populations (Murray & Lopez, 1996) and this can explain why death due to other diseases is projected as being reduced after a period of time (Murray & Lopez, 1996; Kopits & Cropper, 2003). For instance, death due to HIV/AIDS in developing countries is projected to be reduced after a period as the countries are continuing to develop economically and improving health services in developing countries (WHO, 2009).

Death due to road traffic accidents is a notable exception; the growth in motor vehicles that accompanies economic growth usually brings an increase in road traffic accidents in developing countries (Peden et al., 2004; Urry, 2004). Indeed the WHO has predicted that traffic fatalities will

rise to the fifth leading cause of death, and the third leading cause of disability adjusted-life years lost globally by the year 2030 (WHO, 2004; WHO, 2009).

The trend in the number of people killed in road accidents in developing countries is increasing at an alarming stage (Jackobs & Aeron-Thomas, 2000; Mock et al., 2003; WHO, 2009). Over 80% of the world's fatalities on the road occur in low-income and middle-income countries (Mohan, 2002; Mutto et al., 2002; Onabolu et al., 2008; WHO, 2009). The African Region is the least motorized out of the six world regions, but suffers the highest rates of road traffic fatalities (Assum, 1998; Nafukho & Khayes, 2002; Afukaar, 2003; Davis et al., 2003; Peden et al., 2004; WHO, 2013). With only 4% of the world motor vehicles, African roads witness more than 20% of the world total collision fatalities (Khayes & Peden, 2005; Chen, 2010).

The notable increase of road traffic injuries in low and middle-income countries is partly attributed due to: 1) the economic situation in terms of their government`s lack of resources to invest in traffic safety. 2) Cultural beliefs regarding the fatalism and injuries. 3) Lack of research and low literacy rates precluding road users risk perception, risk attitude, risk willingness and risk taking behaviour associated with traffic accidents. 4) Political instability, occasionally predominated by non-democratic governments, that leads to poor allocation of resources on road safety. 5) Competing public health problems particularly with the emergence of diseases such as HIV/AIDS. 6) Distinctive traffic mixes comprising a substantial number of vulnerable road users 7) The rapid rate of motorization that has occurred without a concomitant investment in road safety strategies and land use planning (Vasconcellos, 2001; Khayes & Peden, 2005; Lagarde, 2007; Chen, 2010; WHO, 2009; 2013).

Despite the extent to which the proximal causes of road traffic accident are known (Coffin, 2007; WHO, 2009; OECD, 2010; Leveson, 2010; Salmon, et al., 2012), very little attention is paid to the problem in developing countries (Mohan, 2002; Odero et al., 2003; Banyikwa, 2005; Hazen & Ehiri, 2006). Transport planning in most developing countries is much less compelled to consider safety as a priority issue; accidents are viewed as fatalistic or as inevitable outcomes of development (Jackobs & Aeron-Thomas, 2000; Khayes & Peden, 2005; Chen 2010). In most developing countries, transportation and traffic agencies have road departments but very few have

traffic safety departments (Vasconcellos, 2001). Hence, the development of a safe and efficient transportation system has remained as a key question to several governments in developing countries (WHO, 2009).

In general, road accident causalities need to be considered alongside other injuries and diseases as preventable public health problem (Odero et al., 2003) that respond well to targeted interventions (Vasconcellos, 2001; Peden et al., 2004; Elvik, 2008; WHO, 2009; 2013). Road traffic deaths and serious injuries are to a great extent, preventable, since the risk of incurring an injury in a crash is largely predicable and many countermeasures proven to be effective and existing (Murray & Lopez, 1996; Jacobs et al., 2000; Koonstra, 2002; Bener et al., 2003; Nantulya & Reich, 2003; Kopits & Cropper, 2003; Odero et al., 2003; WHO, 2013).

Major scientific researches (e.g. Smeed, 1949; Wilde, 1982) and effective road safety interventions were implemented in developed countries, with remarkable response that reverted the upward tendency in the number and severity of road traffic accidents (Trimpop, 1996; Leonard, 2004; Sun & Lovegrove, 2008; WHO, 2009; Forward, 2009). This situation is contrary to developing countries where the importance of accident causalities as a public health problem is not well recognised (Mohan, 2002, Odero et al., 2003; Banyikwa 2005), and road safety research could be seen as in its infancy stage (Peden et al., 2001; Mohan, 2002, Odero et al., 2003; Banyikwa, 2005; WHO, 2013).

1.2 Statement of the problem

Urban road traffic and driving culture in Tanzania is partly characterised by low level of safety behaviour (Massaoe, 2007; TARA, 2010), arrogant attitude (LHRC, 2012), under-aged driving (Police report, 2012), and unlicensed drivers (Police report, 2012). Such drivers are reported to be more reckless, non-cautious and inconsiderate to other road users (DFID, Tanzania, 2010; LHRC, 2012). A serious problem experienced in urbanised areas in Tanzania is the chaotic and jumbled manner in which motorcyclists ride in a scattered form on every lane on the road. What is reported to matter to motorcyclists is a space wide enough to pass, not the right lane to follow (Police report, 2012). Mitigation measures for reducing such risk taking behaviour are not readily available in the country (Massaoe, 2007; TARA, 2010).

Risk source from road traffic accidents is generally perceived very low in Tanzania. An important indication is the lack of important road safety institutions in the country. The WHO report (2013), (refer also table 1.3) presents an overview situation of the road traffic system in Tanzania, based on international health/safety standards set to assess/combat the problem of road accidents. The evaluation indicates that there is no institutional framework for the lead agency in the country. No national road safety strategy and no targets set for reducing fatality rates in the country. This is contrary to neighbouring countries. Both Kenya and Uganda have a well-established lead agency for the national road safety activities and their agencies are directly funded by the national budget (Odero et al., 2003; WHO, 2013).

Even though passengers' hazardous behaviour is identifiable as contributing to a substantial proportion of: 1) Driver distraction or hazardous driving behaviour, 2) The likelihood of road accidents in low-income countries (WHO, 2013). Attitudes towards passengers' safety is generally very low in Tanzania. According to WHO report (2013), the protection of passengers of motor vehicles and motorcycles in Tanzania is ranked very poorly. Seat belt law applies to only front passengers and not passengers of the rear seats; this is similar to the helmet law for motorcyclists, just for the drivers and not passengers (Also in Police report 2010). Pickups and Lorries are permitted by law to carry passengers on the "cargo area" (Also in TARA, 2005). Overloading passengers in a car is not an offence in Tanzania (Police report 2010). In Kenya and Uganda, the seatbelt law is applied to both front and rear seat passengers and it is illegal to carry more passengers than capacity of the car (Odero et al., 2003). Similar to Police reports (2010 - 2014), overloaded peer passengers or social groups in public, private or commercial trucks in Tanzania were reported more with risk attitudes and hazardous behaviour associated with road traffic accidents.

The degree of willingness to reduce the magnitude of effect from road traffic accidents is also very low in Tanzania. Risk tolerance behaviour by the government and the public undermines the economic loss caused by road traffic accidents. An estimated GDP lost due to road traffic accidents in Tanzania is 3.4% (WHO, 2013). This is higher when compared to average estimated GDP lost due to road accidents in low-income countries, which is 3.0% (WHO, 2013). However, there is no data displayed in the WHO report for Kenya, Uganda, Rwanda and Zambia about their GDP lost due to road traffic accidents for comparisons. According to WHO report (2013), the estimated

GDP lost in Ghana indicates 1.6%, which is almost half of the estimated GDP lost in Tanzania. For instance, in 2012, the GDP in Tanzania was worth 28.25 billion US dollars and the estimated GDP lost due to road traffic accidents is 3.4% equivalent to 1 billion US dollars. This is three times the approved annual budget for the Ministry of Transport in the year 2012-13, which was 39, 714,465 US dollars (URT report, 2013).

Risk culture and risk tolerance behaviour exhibit largely the use of modern means of road transportation in Tanzania. Safety culture related to vehicle control is not a practice in Tanzania. According to WHO report (2013) (refer table 1.3), there are no vehicle safety standards in Tanzania. Both new car assessment and mandatory vehicle controls over a period are not applicable. This is similar to other neighbouring countries such as Kenya, Uganda, Zambia, Malawi and Burundi. Rwanda has a different case; at least control is by law when the car is registered at the first time in the country (WHO, 2013).

Attitudes towards road safety in Tanzania is very low. This is manifested by lack of explicitly defined road safety regulations and scant enforcement of such regulations (Rwebangira & Peace, 1999; Chiduo & Minja 2000; Banyikwa 2005, Massaoe et al 2007, NTP 2009). When a country lacks clearly defined road safety regulations, it is probably likely other culture specific beliefs become more relevant for road traffic safety or risk taking behaviour. According to the WHO report (2013), enforcement of traffic regulations in Tanzania is ranked as poor. Local authorities cannot set road safety measures appropriate to their environment. No national speed limits. The national drink–driving law is poorly enforced and the percentage of road traffic deaths involving alcohol is not in the records. There is no national child restraint law. There is no national law regarding mobile phone use whilst driving (WHO, 2013). Although these factors could be related to risk taking behaviour, LHRC (2012) associated such factors as a results of existing cultural tendencies of Tanzanian public to perceive and attribute road accidents to destiny, religion and bad luck. Very little is known about factors contributing to risk taking behaviour in Tanzania.

In addition, road traffic accidents differ substantially between rural and urban areas in Tanzania. Police reports (2010; 2014) indicated a significant amount of fatal road accidents more experienced in rural areas than in urban areas. Over speeding and non-compliance to seat belt use are major

factors associated with severity of road traffic accidents in rural areas (Police report, 2014). A report presented by Legal and Human Right organisation in Tanzania LHRC (2012) associated variance in road accidents mortality rates between rural and urban due to reduced access to trauma centres and longer distances to medical centres in rural areas than in urban areas. However, TANROADS (2012) associated such differences with road environment in terms of speed that could probably facilitate risk-taking behaviour. According to TANROADS, urban roads in Tanzania are low speed with speed limits under 50km/h therefore reduced risk of over speeding and severe causalities, whereas rural roads are high speed with speed limits above 90km/h therefore increased risk of speeding and severe causalities. In spite of the potential relevance of differences in road accidents risk between urban and rural areas, very little is known about individual's pattern in risk perception, risk attitudes, risk willingness and risk taking behaviour that manifest revealed differences in road accident risk in these types of geographical areas.

Table 1.3 Road safety in Tanzania based on Global status report (WHO, 2013)

Tanzania: • Population: ***44 841 224*** Income group: ***low*** Gross national income per capita: ***US$ 530***		
Institutional framework	• Lead agency • Lead agency funded in national budget • National road safety strategy • Funding to implement strategy • Fatality reduction targets set • Fatality reduction target	• **No** • **No** • **No** • **No** • **No** • **No**
Safer roads and mobility	• Formal audits required for new road construction • Regular inspections of existing road infrastructure • Policies to promote walking or cycling • Policies to encourage investment in public transport • Policies to separate road users to protect VRUs	• Yes • No • No • No • Yes
Safer vehicles	• Total registered vehicles (2011) • Cars and 4-wheeled light vehicles • Motorized 2- and 3-wheelers • Heavy trucks • Buses • Other Vehicle standards applied • UN World forum on harmonization of vehicles standards • New car assessment programme Vehicle regulations • Front and rear seat-belts required in all new cars • Front and rear seat-belts required all imported cars	• 977 468 • 378 485 • 451 304 • 70 254 • 41 625 • 35 800 • No • No • Front Seats • No
Road accident data	Reported road traffic fatalities (2010) Estimated GDP lost due to road traffic crashes	3 582; 77%M, 23%F 3.4%
Safer road users	Penalty/demerit point system in place National speed limits Subnational Local authorities can set lower limits Maximum limit urban roads Enforcement National drink–driving law BAC limit – general population BAC limit – young or novice drivers BAC limit – professional/commercial drivers l Random breath testing and/or police checkpoints Enforcement % road traffic deaths involving alcohol National motorcycle helmet law Applies to drivers and passengers Helmet standard mandated Enforcement Helmet wearing rate National seat-belt law Applies to front and rear seat occupants Enforcement Seat-belt wearing rate National child restraint law Enforcement National law on mobile phones while driving Law prohibits hand-held mobile phone use Law also applies to hands-free mobile phones	No Not applicable No 30–50 km/h 0 1 2 3 **(4)** 5 6 7 8 9 10 Yes 0.08 g/dl 0.08 g/dl 0 g/dl No 1 2 **(3)** 4 5 6 7 8 9 10 No data Yes No No 1 **(2)** 3 4 5 6 7 8 9 10 Low Yes No 0 1 2 3 **(4)** 5 6 7 8 9 10 Low No Not applicable No No Not applicable
Post-crash care	Vital registration system Emergency Room based injury surveillance system Emergency access telephone number(s) Seriously injured transported by ambulance Permanently disabled due to road traffic crash Emergency medicine training for doctors Emergency medicine training for nurses	No No 112 ≤10% No data Yes Yes

Source WHO report 2013.

The overall assessment of road traffic safety in Tanzania by WHO (in table 1.3), implicates a significant gap of knowledge about the effect and magnitude of risk source from traffic accidents

to both the public and the government. Traffic risk awareness is very silent/muted and contented by Tanzanian public (TARA, 2005; LHRC, 2012), and this has provided less rigorous attention to the problem of road traffic accidents (LHRC, 2012). Very little is known about risk perception, risk attitude, risk willingness and what influences risk taking behaviour of the Tanzanian public in road traffic (TARA, 2005; LHRC, 2012) and at different types of geographical areas.

1.2.1 Main objective of the study

This study "Risk Judgement, Risk taking Behaviour and Road traffic accident in Tanzania" is focused on the importance of the physical and socio-cultural environment in risk taking behaviour associated with road traffic accidents. The main objective is to explore what characterises risk-taking behaviour of the Tanzanian public in road traffic and provide information that can contribute to reducing the accident risk in the country.

1.2.2 Specific objectives of the study

The study is specifically framed to:

1) Investigate and compare pattern and tendencies of risk perception, risk attitudes, risk willingness and risk taking behaviour of Tanzanian public and its social demographic characteristics (such as gender and age group) at different types of geographical areas (urban, semi-urban and rural areas).
2) Identify factors contributing to risk taking behaviour associated with road traffic accidents and examine to what extent these factors can be attributed to compositional condition in geographical areas and to contextual condition.

1.2.3 Research questions

The questions of the study are specifically to find out,

1. Is there a significant difference in subjective risk judgement related to traffic accidents between people living in and experiencing different levels of system risk (by geographical areas and physical environment, road environment, land use, and population density) in Tanzania?

2. Are there any remarkable influential factors constituting risk taking behaviour of Tanzanian public on traffic? If any, to what extent and how those factors are linked to physical and social cultural environment?

1.3 Significance of the study

The analysis of risk perception, risk attitude, risk willingness and risk taking behaviour is to examine the judgements people make when asked to characterize and evaluate the danger of road traffic accidents. This is to aid risk analysis, intervention related programs, sensitisation of traffic risk, and policy-making by providing basis for understanding and anticipating public responses to traffic hazards and improving the communication of risk information among lay people, technical experts, donors and decision-makers. This specific objective assumes that those who promote and regulate public health and traffic safety need to understand how people think about and respond to traffic risk. Without such understanding, well-intended policies may be ineffective. This will also add knowledge on understanding how people experiencing different levels of system risk in Tanzania, perceive and understand traffic risk, how they behave in traffic as well as their priorities and decisions towards traffic safety measures within their locality.

The analysis of factors influencing risk-taking behaviour is to identify and examine a set of factors that can be used to explain risky behaviour of Tanzanian public on traffic. This information will make a contribution to road safety authorities and other stakeholders to understand which attitudinal and behavioural dimensions that could be targeted by human factor campaigns in Tanzania and specifically at different geographical areas within the country. This analysis is based on the fact that, more than 80% of the factors contributing to traffic accidents in Tanzania are associated with human factors. However, there are multiple factors as the interaction between human behaviour, road environment and characteristics of the vehicle.

The results from this study can also be utilised as a baseline for research on road safety in future in Tanzania or other African countries. Currently, there is a potential shortcoming in the literature regarding risk perception, risk attitudes, risk culture, risk willingness and risk taking behaviour associated with road traffic accident in Tanzania as in other low-income countries.

1.4 Embodied physical and social cultural characteristics of the traffic system in Tanzania

1.4.1 Road network

Road network is one of the core elements constituting traffic system. According to World Bank report (2010), there is a very strong and positive correlation between a country's economic development and the quality of its road network. The geography of Tanzania, its size, diversity and dispersion give roads a special position in integration of the national economy (URT, 2012). In particular roads serve rural areas (where the majority of the people live) more effectively than any other mode of transport (DFID Tanzania, 2010).

A road network of about 91,049 km. (TANROADS, 2010) connects Tanzania. These are public roads constructed in urban, semi urban and rural areas. According to Tanzania National Roads Agency (2010); the public road network is classified into two categories; category one involves national roads and category two involves district roads.

Table 1.4.Tanzania Road Network Length (km)

Road Class	Paved (km)	Unpaved	Total	%Paved
Trunk Roads	5,131	7,656	12,786	40%
Regional Roads	702	19,524	20,226	4%
District, Urban, Feeder, Roads	745	57,291	58,037	1%
TOTAL	**6,578**	**84,471.**	**91,049**	**7%**

Source (TANROADS, 2010).

According to TANROADS (2010), the national roads include: a) A trunk road which is primarily a national route that links two or more regional headquarters or an international through route that links regional headquarters and another major or important city or town or major port outside Tanzania. b) A regional road, which is a secondary road that connects a trunk road and a district or regional headquarters or a regional headquarters and district headquarters.

The district roads include: a) A collector road, which is linking a district headquarters and a division centre; linking one division centre to another; linking a division centre with a ward centre; or a road within urban linking with either regional or a trunk road. b) Feeder roads within urban

area and a village access road-linking one ward to other wards. c) A community road within the village or a road, which links a village to a village (TANROADS 2010).

Tanzania's road network is of limited quality and not many roads are paved (TARA 2010). Out of 12,786 km of trunk roads, only 40% is paved (tarmacked). By comparing distance, the number of kilometres covered by District and Regional roads is 7 times the Trunk roads. Almost no District and Regional roads are paved. The overall percentage of the paved roads in Tanzania is only 7%. This indicates low quality roads in the country.

The qualities of roads connecting Regional head quarter in urban areas are paved with limited road safety furniture (TARA, 2010). Trunk roads connecting city centres in urban areas experience heavy traffic congestions (TANROADS, 2010). During the rainy season, transport by road becomes a serious issue in rural areas due to poor road infrastructure. In most cases, people living in rural areas do not travel during rainy seasons (TARA, 2005: URT 2010).

1.4.2 Legal measures in Tanzania

In Tanzania, the search for appropriate and relevant legal measures to control road accidents is one of the problems that have preoccupied the government for a long time. Most of the road traffic laws predate the independence period (Mutabazi & Bishanga, 2001). Their historical development shows that, they were first introduced by the British administration in 1932, since then no new law was established or added other than minor amendment of the 1932 Highway Ordinance Chapter (Rwebangira, 1996).

The Highway Ordinance Chapter 167 of 1932, defined highway boundaries, protected and regulated the use of highways and clarified the responsibilities for the construction of roads (Mutabazi & Bishanga, 2001). The law stood also for alteration, maintenance, protection as well as the supervision of the highway (Rwebangira & Peace, 1999). In the same years, the Road Traffic Ordnance of 1932 was enacted. The law provided for the control of road traffic licensing, and taxation including Motor Vehicles Insurance Ordinance (TARA 2005).

The Road Traffic Ordinance of 1932 continued to apply until 1973 when the Road Traffic Act of 1973 replaced it (Rwebangira et al., 1999). The Road Traffic Act of 1973 included everything from Road Traffic ordinance of 1932, in addition the Road Traffic Act of 1973 established bases for the formation of National Road Safety Council to coordinate road safety activities (TARA 2005; Rwebangira et al., 1999).

In 1990s, the Parliament associated the magnitude of the accident problem with inadequacy of the Traffic Act of 1973. This involved claims that, there were no provisions within the Traffic Act of 1973 relevant for reducing the problem of road traffic accidents. The Traffic Act of 1973, was amended by comprising the law on endorsement and suspension of driving licenses, breath tests by using Alco meters (breathalysers) for determining the levels of alcohol (TARA 2005; Rwebangira et al., 1999).

Moreover, in 1996, the Road Traffic Act of 1973 was again amended by adding provisions that demanded the compulsory use of speed governors in public service vehicles (TARA, 2005). The amendment of the Road Traffic act of 1973 in 1996, aimed specifically to control accidents and accident casualties related to speed of vehicles. However, this was not successful (Police report 2000). Most of the devices installed in the vehicles were either removed or disconnected (TARA, 2005). The Road Traffic Act, of 1973 has been amended several times and it appeared that, various amendments in the laws over years were not effective for combatting the problem of road traffic accidents (Mutabazi & Bishanga, 2001). Instead, ineffectiveness of the law was considered one of the contributory factors.

An important amendment of the Road Traffic Act 1973, as far as road safety is concerned, was carried out in 1979 whereof the National Road Safety Council (NRSC) was established at national level (Massaoe, 2007). In 1986 pursuant to Government Notice No. 392 dated 15th August 1986, road safety committees were established at both regional and district levels (URT, 2005). Between 2000 and 2010 there were much more efforts on improving road traffic education than amendment of laws (TARA, 2011).

The overall assessment of traffic laws in Tanzania indicates 1) inefficiency, 2) out-dated 3) do not cover important risk areas especially those related to protection of vulnerable road users, risk attitudes and risk taking behaviour of Tanzanian public in road traffic. The laws are more focused on income generation other than environmental and safety generation (Rwebangira et al., 1999)

1.4.3 Institutional set-up of the leading agency.

One of the most common problems mentioned in several researches associated with road traffic accidents in Tanzania is about lack of coordination between institutions or departments or organisations working on road safety issues (Rwebangira et al., 1999, Chiduo & Minja 2000, Banyikwa 2005, Massaoe, 2007, NTP 2009). It is noted in the Surface and Marine Transport Authority (SUMATRA) report by Massaoe (2007) and also in the National Transport Policy (NTP, 2009) that : the current institutional set up in Tanzania is specifically based on "The Road Traffic Act" which was prepared and enacted in 1973. The Road Traffic Act of 1973 recommended a formation of a National Road Safety Council, which includes responsible government ministries, NGOs, CBOs, professional organisations, and other stakeholders.

The 1973 Road Traffic Act endorsed the National Traffic Commander to be the permanent secretary of the National Road Safety Council. The main objective of the 1973 Road Traffic Act was to create a coordination of all road safety stakeholders and enable them to make collective decisions about safety plans and strategies. This institutional set-up is still the same today, and no amendments of the Act have been made recently (Police report, 2010).

The functions of the National Road Safety Council set by the 1973 Road Traffic Act include:

1) To promote research into causes of road accidents. To promote statistical research as to the number types and costs of traffic accidents. To diagnose from research and statistical records or any other sources, causes of road accidents, and to suggest counter-measures to combat accident problems, and to identify local accident hazards, devise and suggest remedies and advise the authorities concerned for appropriate action.

2) To advise on current or projected ideas concerning motor vehicle or trailer design. In addition, equipment and maintenance with particular reference to safety devices.

3) To encourage and provide training and education for road users', increase road users' knowledge of particular hazards i.e. how they arise and how to cope with them. Induce a more positive attitude to road safety through lectures, demonstrations, campaigns or any other means; collect, prepare and disseminate educational material on road safety; and prepare and promulgate fully integrated programmes of public information and publicity by means of all appropriate media of mass communication.

Table 1.5 NRSC members and their related road safety activities

ORGANISATION	RELATED DUTIES
Ministry of Work (Construction)	• Road financing • Infrastructure development (main road construction) • Road furniture development for the traffic safety • Road engineering including qualities and safety facilities. Such as road signs and safety contracts • Road tolls and high way maintenance
Ministry of Finance	• Driver Licencing (Tanzania Revenue Authority) • Motor vehicle Licencing (Tanzania Revenue Authority)
Ministry of Home affair	• Enforcement (Traffic Police) control, regulations, laws and penalties • Safety control and licencing of commercial vehicles (SUMATRA) • Road Safety campaigns • Vehicle inspection (Police)
Minister Local Government	• Internal road financing (Local councils) • Infrastructure development within districts • Road safety within localities including safety measures
Ministry of Education and Vocation Training	• Driver Training • Registration of Driving schools • Development of road safety curriculum
Ministry of Health and Social Welfare	• Provision of Health certificates for drivers • Treatment of accident injuries • Health insurance • Alcohol test • Records of accident injuries
Ministry of Justices and constitution affairs	• Interpretation of Traffic laws, • Amendment of traffic laws, • Enforcement of traffic laws, • Application of traffic laws to road users.
Ministry of Land, Housing and settlement Development	• Urban planning, including reservation of enough space for road extension, • Reservation of parking spaces • To ensure smooth traffic including street roads changed into one way driving
Ministry of Transport	• Transport policy • Road safety policy • Lobbying and supporting enforcement function
NGOs, CBOs, Professional Organisations, Trade Union, etc.	• Sensitisation of safety attitude • Research • Lobbying on issues related to policy and governance • Advocacy and capacity building on issues related to traffic safety
Internal Donors	• Financing, road constructions, • Financing policy making process • Financing safety equipment • Financing road safety counter measures • Financing road safety campaigns
Oil companies	• Service providers • Financing road safety campaigns.

Source: *The Office of the Police Traffic Commander, Dar es Salaam.*

Despite its existence since 1973, and its credible list of members. The National Road Safety Council of Tanzania has been dormant for so long. A similar recommendation was noted in the National Transport Policy 2003 cited in Massaoe (2007) that: major weaknesses in the regulation of road traffic safety in Tanzania include lack of power, poor coordination between authorities, poor governance, corruption, and poor enforcement. This is partially due to a very weak structure of the National Road Safety Council (NRSC), which has responsibility for coordination and research among others.

The WHO report (2009) argues that, a leading agency is central to team work and cohesion of the road safety stakeholders. Several international studies gave evidences of the relationship between lack of cohesion between road safety stakeholders and the problem of road safety management (Peden et al., 2001; Mohan, 2002; Massaoe et al., 2007). Mohan (2002) argues that; even if countries will manage to create strong lead agencies to coordinate road safety activities, a need for leadership and a long-term vision, are the most critical element to trigger institutional development, ensure requisite resources, and to achieve improved road safety especially in developing countries.

In Tanzania, the problem of leadership and weak leading agency has been existing without a solution since 1973. The current leading agency "The National Road Safety Council" is powerless in terms of its structure, resources and low mandates given by the 1973 Road Traffic Act, which was used for its establishment. This situation has contributed significantly to 1) poor coordination of road safety stakeholders, 2) weak enforcement mechanisms of the road safety regulations, 3) poor management of road safety in different sectors, 4) inexistence of effective road safety policy and its implementations, 5) lack of professionalism, and 6) poor engagement of the public.

1.4.4 Road Safety policies in Tanzania

Road safety is produced, like other goods or services (Smith, 2002). Its production requires to be managed within a policy framework, which is achievable even with limited resources (Paquette, 2002). A policy document is refereed to principles or protocols to guide decisions and achieve rational outcomes (Althaus et al, 2007). These are statements of intent, and are implemented as procedure (Stone, 2008).

There are four primary policy documents directly relating to road safety in Tanzania. These are 1) the National Transport Policy, issued by the then Ministry of Communications and Transport in 2003. 2) The Rural Development Policy released by President's Office, Regional Administration and Local Government in December 2003. 3) the Draft Road Safety Policy prepared by the Ministry of Infrastructure Development in 2005, and 4) the National Road Safety Policy prepared by the Ministry of Infrastructure Development in 2009 (TARA 2010, URT 2010, Police Report 2012).

THE UNITED REPUBLIC OF TANZANIA **The National Transport Policy** Ministry of Communications and Transport in 2003	THE UNITED REPUBLIC OF TANZANIA **The Rural Development Policy** President's Office, Regional Administration and Local Government (December, 2003)	THE UNITED REPUBLIC OF TANZANIA **The Draft Road Safety Policy** Ministry of Infrastructure Development in 2005	THE UNITED REPUBLIC OF TANZANIA **National Road Safety Policy** Ministry of Infrastructure Development (September 2009)

The vision of the National Transport Policy 2003 (NTP) is to have efficient and cost-effective domestic and international transport services to all segments of the population and sectors of the national economy with maximum safety and minimum environmental degradation. Its mission is to develop a safe, reliable, effective, efficient and fully integrated transport infrastructure and have operations, which will best meet the needs of travel and transport by improving levels of service at lower costs in a manner, which supports government whilst being economically and environmentally sustainable (TARA, 2010).

The Rural Development Policy (RDP) was promulgated in 2003 with hindsight of the National Development Vision 2025. In this respect, the Rural Development policy of 2003 acted as an instrument of achieving the five main attributes of the National Vision 2025, which was focused on high quality livelihood especially in rural areas, peace, stability and unity, good governance, a well-educated and learning society, and a competitive economy capable of producing sustainable growth and shared benefits. To attain this, the policy outlined strategies to be taken by Local

Government Authorities and other stakeholders to rehabilitate and maintain the present rural roads network and expand it in order to reduce transport costs and travel time. Rehabilitation and maintenance presupposes, among other things, putting in place safety measures or mechanism in order to ensure that the roads are safe for both passengers and goods (TARA, 2010).

The Draft National Road Safety Policy 2005 (NRSP) is a product of a study, which was commissioned by the then Ministry of Works in 2003/4 to develop the National Road Safety Master Plan for Tanzania Mainland and Zanzibar with financial support from the World Bank. The study was set to identify series of shortcomings and opportunities to improve road safety related policies in Tanzania. Consequently, the Master Plan recommended the appointment of a Road Safety Champion to follow-up on the most crucial organisational suggestions and the preparation of three crucial documents, namely, the Road Safety Policy, the Road Safety Strategy and a Draft Bill for establishment of a Road Safety Board and Road Safety Fund (TARA, 2010). The NRSP was prepared with a strong vision; "nobody should be killed or seriously injured due to a road traffic accident". The mission is, to continuously reduce the severity and frequency of road accidents in an efficient and professional manner.

The National Road Safety Policy of 2009 was adopted and endorsed by the parliament in 2010 as a pilot document; its vision is to have a safe environment for road traffic system, which is in accordance with internationally accepted standards. The policy seeks to guide and unite all stakeholders and put emphasis on cooperation and sharing of knowledge, experience, expertise and resources.

The main goals of the policy are 1) to continually reduce the occurrence and severity of road crashes and consequently the level of fatalities and injuries in an efficient and professional manner. 2) To reduce road deaths by at least 25% by 2015 taking 2008 as the base year.

One of the critiques to these road safety policies in Tanzania is that, all the policies reviewed above, are not intensive enough to address all major issues of the current traffic system. In this context, their implementation one can hardly say that they need more revision and improvement to provide enough coverage of the current traffic system. However, successful implementation of these policies will depend on the coordination among the various stakeholders (including NGOs) in the road transport sub-sector.

According to WHO (2013), national policy on road safety is considered to be document that provides the basis for action to be taken jointly by the government and its nongovernmental partners. URT report (2010) and TARA (2009) noted that, the NGOs in Tanzania are not fully engaged into road safety policies. This is together with their limited engagement to road safety activities in the country (TARA, 2010). Poor engagement of Non-governmental organisations in road safety issues implicate less influence to political agenda related to road safety priorities. In general, Non-governmental organisations can offer the government cooperation and joint initiatives to achieve goals set for national road safety over a period of time, they can provide their expertise on road safety interventions, and they can assist the government to secure funds for national road safety advocacy.

1.4.5 Government initiatives towards road safety in Tanzania

The road transport system is the most important mode of transport in Tanzania (Massaoe, 2007), the government and the public is concerned about the safety of the system. The number of reported traffic accidents and related causalities have been increasing in spite of the government and other stakeholders' efforts to combat the problem.

The Annual Government Report (URT, 2012) and the first report of the Ministry of Transport (MoT, 2012). Indicates that: Since independence in 1961, there have been a number of government-led initiatives geared towards improvement of road safety in the country (refer table 1.6). Despite such initiatives and interventions, the state of road safety has been worsening and prolonging to deteriorate every year (National Transport Policy 2009: URT report 2010 & 2012, MoT, 2012).

Many critiques to government initiatives towards road safety are centred to; 1) they are not research based interventions or solutions (Massaoe, 2007; TARA, 2012), 2) no goals set to be achieved within a period of time (DFID Tanzania, 2010; WHO, 2013) and 3) no relevant policy imposed to guide the implementation of the strategies including vision and mission (WHO, 2013).

Table 1.6 Government initiatives (chronologically from 1961 to 2012) towards road safety in Tanzania.

One	The enactment of the Motor Vehicle Driving Schools (Licensing) Act, Cap 163 R.E. 2002 in 1965 to provide for the licensing of proprietors of motor vehicle driving schools and the prescription of qualifications for driving instructors and for connected matters;
Two	The repeal of the Traffic Ordinance, Cap. 168 and enactment of the Road Traffic Act, 1973 (now Cap. 168 R.E. 2002) and its accompanying traffic regulations;
Three	Establishment of the National Road Safety Council in 1973;
Four	Establishment of the Traffic Police Force in 1976 under the Police Force Ordinance, Cap. 322 to enforce the traffic law and regulations;
Five	Promulgation and over 105 repeals / amendments of various traffic regulations and rules have been made;
Six	The establishment of the National Construction Council in 1981 to promote the development of the construction industry; Roads, Bridges, Road furniture etc.
Seven	Prohibition of public transport vehicles (inter-regional transport) to travel between 22:00 hours local time and 05:00 hours local time in the early 1990s;
Eight	Introduction of mandatory installation of speed governors for all public transport vehicles in the mid-1990s;
Nine	Establishment of the Road Safety Unit in the then Ministry of Works (now Ministry of Infrastructure Development) in 1990s to deal with policy formulation on road safety in Tanzania;
Ten	Involvement of the National Institute of Transport (NIT) and the Vocational Education and Training Authority (VETA) in driver training in the early 1990s;
Eleven	Commissioning of consultants to prepare a road safety programme in 1995 by the then Ministry of Works (now Ministry of Infrastructure Development);
Twelve	The signing of the SADC protocol on transport, communication and meteorology in August, 1996;
Thirteen	Establishment of the Roads Fund and Roads Fund Board in 1998 and 1999 respectively;
Fourteen	Establishment of the Tanzania National Roads Agency (Tan-Roads) in July, 2001 aimed at efficient execution of road maintenance and development of works for trunk and regional roads network;
Fifteen	Enactment of the Surface and Marine Transport Regulatory Authority Act, 2001 to establish a regulatory authority in relation to the surface and marine transport sectors and to provide for its operation in place of former authorities and for the related matters;
Sixteen	Appointment of a Road Safety Champion to facilitate implementation of reform of road safety subsector in 2005;
Seventeen	Commissioning of consultants to undertake a study for the development of a National Road Safety Master Plan for Tanzania Mainland and Zanzibar by the then Ministry of Works (now Ministry of Infrastructure Development) which was completed in 2004;
Eighteen	In April/May 2005 the then Ministry of Works carried out a study for motor vehicle inspection;
Nineteen	The repeal of the Highways Ordinance, Cap. 167 and the enactment of the Roads Act, 2007 – Act No 13 of 2007;
Twenty	Commissioning of a Study on Road Crashes in Tanzania Mainland in 2007.
Twenty one	Special government ministry for transport (Ministry of Transport) in 2012.

Source: *Sited from Ministry of Transport (MoT) report 2012.*

According to TARA (2012), the government initiatives have not considered issues relating to road safety research specifically on: 1) Improvement of data quality (accident causalities) by developing and establishing appropriate and reliable systems. 2) Pedestrian and cyclist mobility: space in the road infrastructure for mobility and safety of all road users. 3) Identification and testing of interventions for the vulnerable road users, pedestrians and cyclists, and documentation of best practices (what works?). 4) Evaluation of evidence on specific risk factors, such as extent of alcohol and drug use among drivers and pedestrians. 5) Evaluation of public transport systems. 6) Policy issues i.e. institutional, political, legal and economic factors that govern the operation and safety of public transport system. 7) Improvement of emergency medical systems especially in

rural areas. These are issues, which need to be tackled for the improvement of the road safety system in the country.

1.5 Trend of road traffic accidents, fatalities and injuries in Tanzania.

The trend of reported road accidents, fatalities and injuries annually, from 1977 to 2013 (shown in table 1.7 and fig. 1.1) indicates a significant growth of the road safety problem in Tanzania. According to Police report (2014), for a period between 1977 and 2014, 498,509 reported accidents led to 67,511 fatalities and left 449,178 seriously injured people.

In 2000, the Government emerged with a millennium development plan 2025 (NTP, 2009, URT report, 2010), along with other objectives, by 2015, the government intended to reduce at least 25% of the number of accident causalities in the country (NTP, 2009). The action plan was to ensure that, the number of causalities obtained in 2000 should not increase rather than reducing consecutively every year to 25% by 2015 (NTP, 2009). The assessment of this action plan was undertaken in 2005, 2007 and 2009. Results indicated an opposite trend to the 2015`s government objective plan. Casualty trend indicated an average increase of 10% every year (NTP, 2009, Massaoe, 2007). The country's economic loss due to road traffic accidents raised from 2% of the GDP in 2000 and eventually to 3.4% in 2009 (URT report, 2010).

Table 1.7 Reported Road Traffic Accidents, Fatalities and Injuries per year (from 1977 to 2013) for Tanzania

Year	Road accidents	Fatalities	Injuries
1977	6,410	878	6,051
1978	7,625	760	5,556
1979	6,209	1,016	5193
1980	7,865	954	6,381
1981	9,274	960	6,126
1982	7,034	843	5,897
1983	6,494	927	6,126
1984	7,082	1,021	6,670
1985	8,119	1,071	7,613
1986	7,596	1,062	7,375
1987	9,674	1,117	7,937
1988	9,538	1,256	9,283
1989	9,925	1,080	8,139
1990	10,107	1,059	9,910
1991	10,611	1,129	10,249
1992	11,865	1,367	11,406
1993	12,595	1,483	11,513
1994	13,781	1,548	12,377
1995	13,747	1,663	12,625
1996	14,050	1,809	12,515
1997	14,335	1,625	12,490
1998	12,234	1,583	11,381
1999	13,478	1,612	12,845
2000	14,548	1,737	14,094
2001	13,877	1,866	12,568
2002	15,490	1,994	15,150
2003	16,664	2,155	16,825
2004	17,039	2,366	17,231
2005	16,388	2,430	16,286
2006	17,677	2,884	15,676
2007	17,753	2,594	16,308
2008	20,615	2,905	17,861
2009	22,739	3,223	19,263
2010	24,665	3,582	20,656
2011	23,986	3,981	20,802
2012	23,578	3,969	20,111
2013	23,842	4,002	20,689
Total	**498,509**	**67,511**	**449,178**

Source; Traffic Police (2014)

Figure 1.1Reported Road Accidents, Fatalities and Injuries (1977 to 2013) for Tanzania Mainland

There are some concerns that the trends of accident casualties as recorded in police data- base (refer table 1.7 and fig 1) may not be an altogether accurate reflection of the true situation in Tanzania (TARA, 2010). Indeed, there is general recognition and acceptance that the police record is an underestimation of the actual number of RTA casualties especially in rural areas (Massaoe, 2007). This has been acknowledged for some time and many studies have estimated a 30% shortfall (TARA, 2010). The government report (URT report, 2011)) estimated only 15% shortfall.

WHO (2009) claimed that; due to low level of technology in low income countries, underreporting of road accident casualties may account for more than 30% serious casualties especially those in remote areas. Generally, the validity of traffic accident statistics depends on the reliability of accident reporting. Every country has a road accident recording system (Ogden 1996; WHO, 2009), invariably based on some form of legal obligation to report accident to the police. The amount of detail, the accuracy of legal reporting, the percentage of accidents recorded and their availability to non-police users varies anonymously from country to country. In most cases, reliable statistics about road traffic accidents implicate two important factors; 1) a good data base system in the country, and 2) well defined mechanisms for reporting and recording accidents and related casualties (Vasconcellos, 2001).

URT (2010) declared that, police record is the only reliable and official accident report database in Tanzania. Traditionally, the forms used to collect information about accidents and accidents causalities are very similar to the ones used in many commonwealth countries that are based on British standards (Police report, 2009).

According to police report (2012), mechanisms set to receive accidents reports are based on Insurance Act of 1977 and Criminal law of 1973. Any property damage related to traffic accidents must be reported to police before insurance claims to be processed as it is stated in Insurance Act of 1977. No treatment to any kind of injury in any hospital before filling out a police form PF3 to determine the source or cause of the injury as stated in Criminal law of 1973. These two mechanisms contribute to about 90% of the legal reported road accidents in the country.

1.6 Trend of road traffic accidents by potential factors in Tanzania

Museru, Mcharo and Leshabari (2002) made a descriptive analysis of road accidents data in Tanzania by using routine police records (between 1990 and 2000), about the trend and conservative factors associated with traffic accidents in Tanzania. In their study, they found that: Inappropriate road use behaviours' by different road users were reported to be the major cause of accidents with driver's inappropriate behavior contributing 52%.

Åstrøm, Moshiro, Hemed, Heuch and Kvåle (2006) investigated social and behavioural correlates of perceived vulnerability to traffic injuries in urban and rural settings in Tanzania. In their study (Perceived susceptibility to and perceived causes of road traffic injuries in an urban and rural area of Tanzania); respondents perceived driver recklessness and driver drunkenness as the leading causes of traffic injuries in both urban and rural areas in Tanzania.

Nordfjærn, Jørgensen and Rundmo (2011) in their cross cultural comparison of road traffic risk perception, attitudes towards traffic safety and driver behavior study in Tanzania, Uganda, Ghana, Russia, India and Norway. Differences in driver attitude and driver behaviours were examined. The additional aim of their study was to test whether the risk constructs and driver attitudes explained the variation in risky driver behavior in these countries. They found that, Tanzanians reported the highest willingness to take risks both in traffic and in other contexts in general.

Kircher and Anderson (2012) investigated Truck Drivers Opinion on Road Safety in Tanzania. In their survey, drivers who participated in the study, reported driving trucks without average breaks, driving 24hrs without rest, and around 40% of the trucks driven by those drivers had completely no seatbelts. . When the drivers were asked to mention the most three common crash causes, driver-related causes were named frequently. Drivers were said to be reckless, intoxicated, inattentive or drowsy.

Massami and Myamba (2014) applied Multifactor Based Fuzzy Evaluation to determine the weight of influential factors based on real data over a period of time (weight by fuzzy approach), in comparison with expert's views and routine police evaluation of traffic accidents (weight by non-fuzzy approach) in Tanzania. The results (refer table 1.8) indicated that; human element (error) is the major risk factor contributing to the cause of traffic accidents in Tanzania.

Table 1.8.Weight of factors contributing to accident risk in Tanzania, by fuzzy approach and non-fuzzy approach

Risk factor	*Weight by fuzzy approach*	*Weight by non-fuzzy approach*
Human element	0.633	0.77 = 77%
Vehicle element	0.266	0.16 = 16%
Road element	0.01	0.07 = 7%
Total	1.000	1.00 = 100%

Source; Massami and Myamba 2014.

Examining how the Tanzanian public in different geographical areas perceive and understand traffic related risk is interesting and is important for determining how the Tanzanians behave in traffic, as well as for priorities and decisions for traffic safety strategies. The current road accident causalities and traffic safety conditions in Tanzania are already serious and they will worsen in the near future (Banyikwa, 2005; Tanzania Traffic Police Report 2009). These accidents are mostly associated to human behaviour and could be avoided if the road users become more responsible. (Odero, 1997).

1.7 Structure of the study

This thesis constitute seven chapters; chapter one is about the 1ntroduction, aims and background of the study. It includes statement of the problem, research objectives, research questions, significance of the study, embodied physical and social cultural environment of traffic system in Tanzania, trend of traffic accidents and accident causalities in Tanzania, as well as trend in accident causation factors in Tanzania. Chapter 2 is about geographical perspectives of the study including philosophical methodologies (Naturalism, Realism, Behaviourism, and Marxism). Chapter 3 is about theoretical perspectives that present the application of System approach, Risk theory and cultural approach, Political ecology approach, and Modernisation approach to the study of road traffic accidents. Chapter 4 is about research design and methods. Covering methods and techniques used to accomplish the study and how the primary and secondary data were collected, the instruments used and the means of analysing data. Chapter 5 is about the analysis of risk perception, risk attitude, risk willingness and risk taking behaviour by geographical areas (urban, semi-urban and rural), by sex (males and females) and by age group. Chapter six is about modelling factors influencing risk taking behaviour associated with road traffic accidents and examining identified factors by geographical area (urban, semi-urban and rural). Chapter 7 is about the

conclusion, including summary of the study, summary of the findings, recommendation and general conclusion of the study.

1.8 Used terminology to address dysfunction of road traffic system

Currently, there is a silent debate going on by different organisations associated with road transport sector, health sector and governments' institutions worldwide about having a common terminology in addressing the dysfunction of road traffic system and its resulting effect. This is considered partly as a methodological issue as well as a philosophical phenomenon (Anderson, 2012). According to Anderson, the underlying debate is interpreted in terms of a struggle for ownership over this truly interdisciplinary field of research. For instance, the World Health Organization use the term "road traffic injury" (WHO, 2013) while the U.S. Census Bureau uses the term motor vehicle accidents (MVA) (USCBS, 2014) and Transport Canada uses the term motor vehicle traffic collision (MVTC) (TIC, 2013). Other common terms include auto accident, car accident, car crash, car smash, car wreck, motor vehicle collision (MVC), personal injury collision (PIC), road accident, road traffic accident (RTA), road traffic collision (RTC) and road traffic incident (RTI).

This polarisation to some extent contributes to theoretical stagnation (Elvik, 2005; Anderson, 2012). In the field of public health, Mercy et al (1993), Krug (1999) and Peden et al (2004) used road traffic injuries to address surveillance, magnitude and effect of road traffic accidents. William Haddon, a physician in his 1) Road Safety Measure Matrix used the term crash to address different phases of road accident and 2) in his matrix model for motor vehicle collision, he used the term collision to address events related to different phases before, during and after road accidents (Commission for global road safety, 2008). In social science, Jørgensen and Abane in their model for traffic accidents used the term road traffic accidents to address multiple causes and prevention of road traffic accidents that occur in developing cities (Jørgensen and Abane, 1999).

Historically in the United States, use of terms other than "road traffic accidents" had been criticized for holding back road safety improvements, based on the idea that a culture of blame may discourage the involved parties from fully disclosing the facts, and thus frustrate attempts to address the real root causes (USCBS, 2014). According to USA National Highway Traffic Safety Administration, a philosophy behind the use of the term "road traffic accidents" is that, accident

is considered as undesirable incidental and unplanned event that could have been prevented had circumstances leading up to the accident been recognized, and acted upon, prior to its occurrence.

On the other hand, most scientists from the health sector have been implementing a strong campaign against the accident concept among leading unintentional injury prevention (Anderson, 2012). According to Anderson, the core interest of the scientists from the health sector is more focused on "major trauma" and not "accident per se". Their philosophical stand behind the use of the term injury is that, injury has the potential to cause prolonged disability or death (WHO, 2013)

Engineers are specifically using the term "collision or crash" other than accident or injury (Homburger et al, 1992; Das et al, 2004). According to Das et al., the use of the term collision in the field of engineering implicates a methodological approach in referring an event in which 1) two or more bodies exert forces on each other for a relatively short time, 2) with a change in velocity and momentum, 3) as well as kinetic energy. The use of the term collision to address dysfunction of road traffic system is more relevant to engineering approach than social or health approach (Homburger et al., 1992).

In this study, the term "road traffic accidents" is chosen relevant to address dysfunction of road traffic system. Theoretically, the term "road traffic accidents" implicate social context in which attempts to advance strategic countermeasures through system thinking approach is reflected. Road traffic accidents interlink; 1) the environment, comprising the road system and the wider physical and built-up environment, 2) the means of transport, comprising the volume and quality of vehicles on the modes of transport and 3) human behaviour, comprising the social-demographic characteristics of road users and their general behaviour on street.

CHAPTER TWO

Geographical perspective of the study

2.0 Introduction

Any approach towards understanding the problem of road traffic accidents rise from philosophical predispositions in which the knowledge of underlying mechanisms is defined and interpreted (Clifford et al. 2009). This study "Risk judgement, Risk taking behaviour and Road traffic accidents in Tanzania" is organised and conducted under the principles and ethics within the discipline of human geography.

Human geography shades into both natural science and humanities (Flowerdew & Martin, 2005; Cloke et al., 2005; Blij & Jan De, 2008). As such, it shares many of the approaches used by other social sciences, and faces similar philosophical choices (Kitchin & Tate, 2000; Cloke et al. 2004; Clifford et al. 2009). What makes this study geographical is the use of particular underlying philosophical predispositions in human geography. The application of spatial approaches, traditionally man-environment relations as well as space and place in understanding occurrence and the distribution of road traffic accidents, their impact, safety strategies, variations according to geographical scale and the extent to which traditional solutions may or may not reduce the level of accidents.

2.1 Spatial relationship approach

Without claiming any precedence over other approaches, the geography of road traffic accidents can be explained in terms of regional variations including urban-rural variations and enormous potential on their link with population density and distribution as well as movement and interaction of people from one place to another (Whitelegg, 1986).

A geographical approach to road traffic accidents research considers whether space, place or location matter or make a difference for patterns of road traffic accidents. Spatiality is an important part of the geographical imaginations enabling recognition the role of space and place in a geographic research (Crang & Thrift, 2000; Flowerdew & Martin. 2005). The use of geographical

concepts relating to space and place is considered a vital and an important identification of a geographic research (Flowerdew & Martin. 2005).

The concept of space and place in road traffic accidents enables a researcher to understand the distribution in occurrence of road traffic accidents, variation according to geographical scales, its impact, and reduction strategy (Cutter, 1993; Elvik & Vaa 2004).

According to Cutter (1993), geographic scale is important in understanding technological hazards, their distribution, impacts and reduction. Road traffic accident are a public health problem that shows considerable geographical variation (Krug 1999). In the past, road traffic accidents used to be considered a problem of industrialised countries but are now becoming an epidemic in developing countries (Peden et al., 2004). A possible explanation may be spatial diffusion of urbanisation. Urban and densely populated areas experience more accidents (crashes) and higher injury rates than rural and sparsely populated areas which experience fewer but more severe accidents (fatal crashes and a higher death rate) (Jørgensen, 2004).

Agnew & Smith (2002) interpreted space as the result of politics over place, in his elaboration politics refers to the social organization of a place. According to Nnolli (1987) and Simon (2007) politics is who gets what, when, how and sometimes why in terms of distribution and allocation of resources in a society. Politics play a vital role in determining the way in which the public view and utilise resources to improve road safety. According to Simon (2007), there is a strong need to influence the political agenda in order to achieve any intervention in a society. In principal, organisation of road safety space in a place is politically associated with budget allocation, policymaking, formation of rules, regulations and culture (Elvik& Vaa, 2004). The government`s policy or its priority agenda influences all the factors associated with traffic accidents, be it the quality of the road network, the associated physical environment, traffic engineering, the condition of the vehicle or vehicle fleet stock, behaviour and attitudes of road users.

Casey (1997) referred to the concept of place over space in geography as the experience of human subjects in a place. Casey`s philosophy reflects the value of human practice in a place; place (site) is the modification of space (activities). This idea can be directly applied in the study of road traffic accidents by comparing the traffic systems with the road patterns and the magnitude of RTA risk in different geographical areas (such as urban, semi-urban and rural areas). A transport network

pattern in urban areas reflects the built up environment with its associated business (economic) activities, social activities and political activities as well as number of people and quantities of goods and services that are transported to and from and between urban areas (Banyikwa, 2005).

The geographical context of road traffic accidents is interesting for two major reasons. First, the frequencies of severe accidents in road traffic are unequally distributed between specific geographic areas within countries, as a disproportionate amount of severe road traffic accidents occur in rural compared to urban areas (Åstrøm et al. 2006; Eiksund, 2009). Second, a geographic redistribution of accident frequencies occurring between developed and developing countries (Rakauskas et al., 2007; Nordfjaern et al., 2011).

Geographic differences in road traffic accidents may in part be due to differences in indirectly non-human factors such as quality of vehicle parks and the road infrastructure in different settlement and countries (Nordfjaern et al., 2011). For instance, speed limits are higher and the roads are of poorer quality in rural areas than in urban areas. According to Nordfjaern et al. (2011), more modern and advanced cars with improved safety devices are available in developed countries than in developing countries.

Variation in subjective risk judgment in relation to the danger of road traffic accidents is another potential reason for geographic differences. Research indicates that risk perception related to a range of hazard sources varies across different places and countries (Lund & Rundmo, 2009; Nordfjaern & Rundmo, 2009). The extent of worry when people consider the risk of traffic accidents could also be relevant for geographic differences in road traffic safety. Research shows that people in rural settlements within different countries may be less likely to use protective transport devices such as seat belts (Diener & Richardson, 2007) and show lower behavioural willingness to reduce their speed in road traffic (Eiksund, 2009).

2.2 Underlying philosophical methodology

In any discipline, there will always be a number of underlying philosophical predispositions; some of these predispositions involve the nature of social knowledge itself, the nature of social reality, and the locus of human control in action (Sayer 1992; Flowerdew & Martin 2005). Contemporary human geography is a diverse discipline that comprises different philosophies, concepts, and techniques that complement one or other while combining a wide range of procedures (Johnston, 2009). The main-focus is to understand human societies along with their physical and social cultural environment through scientific methods (Taylor 1994).

Philosophising the study of road traffic accidents in human geography involves the application of the spatial relationships approach, concepts of place and space and the use of environmental approach man-environment tradition in geography (Peet, 1998; Flowerdew & Martin 2005; Moseley et al., 2007).

In table 2.1 the present study relate to a number of major philosophies in contemporary geography such as naturalism, behaviourism, realism and Marxism.

Table 2.1 Underlying philosophical methodologies chosen for the study

Philosophy		Description	Methodology	Application
1	Naturalism (Both Empiricism and Positivism)	By carefully and objectively collecting data about social phenomenon, we can develop conclusions to predict and explain human behaviour in terms of possible cause and effect. In addition, propositions/hypothesis about phenomenon is tested (Kitchin & Tate, 2000)	Verifying factual statements from the surveyed questionnaire (quantitative) and presentation of experienced facts from the interviews.	In this study, risk perception, risk attitude, risk willingness and risk taking behaviour are operationalised by variables and measured by a rating scale. Exploratory factor analysis is used for measuring variables to an index, Cronbanch's alpha for estimating test reliability as well as regression analysis for examining the relationship between specified set of predictors and a dependent variable. In addition qualitative data are used to provide more insight of the quantitative data
2	Realism	Investigation of the underlying mechanisms and structures of social relations, and identifying the building blocks of reality (Kitchin & Tate, 2000)	Triangulation approach, (quantitative and qualitative).	Accidents as malfunctions of traffic system cover a wide range of causation: from minor accidents to highly improbable failures. Some factors contribute to the occurrence of a collision and are therefore part of accident causation. Other factors aggravate the effects of the collision and thus contribute to trauma severity. Some factors may not appear to be directly related to road traffic injuries. Some causes are immediate, but they may be underpinned by medium-term and long-term structural causes (such as physical and social cultural environment (settings))
3	Behaviourism	Acknowledges, explicitly or otherwise, that human action is mediated through the cognitive process of information (Kitchin & Tate, 2000)	Verifying factual statements from the surveyed questionnaire (quantitative) and presentation of experienced facts from the interviews.	Safety culture (enforcement mechanisms, safety policies, appropriate traffic control, and social organisation of safe traffic system) arises when the public recognise accidents as a potential risk source to their environment
4	Marxism	Historical materialism, concerned with investigation of political and economic structures by considering how society might operate under different social conditions (Kitchin & Tate, 2000)	Observation, interviews and interpretation of secondary sources of qualitative and quantitative.	The trend of road traffic accidents worldwide verifies that the magnitude of the problem is decreasing in high income countries and increasing in low income countries. This implicates some general features of Marxism's economic transformation, which influence simultaneously the improvement of other social problems and road traffic accidents.

Source; Modified after Kitchin & Tate (2000)

2.2.1 Naturalism and road traffic accidents

In doing a research, one of the fundamental choices that any social scientist has to make is that between the philosophical positions of naturalism and anti-naturalism (Watkins. 1994). Naturalism involves the claims that research in the social science is essentially the same as that in the natural sciences like physics or chemistry. Anti-naturalism is the opposite of that (Flowerdew and Martin. 2005). Researching road traffic accident in social science is essentially the same as in natural science (Odero et al., 2003; Elvik & Vaa, 2004) and the epistemological approach (methodology) is essentially the same as that used in natural science (Jacobs & Bugaley. 1995).

A system approach is one of the dominant scientific enquiries in the study of road traffic accidents. It is an interdisciplinary theory about the nature of complex systems in nature, society, and science, and it is a framework by which one can investigate and/or describe any group of objects that work together to produce some results and can hypothetically be tested (Mikkonen 1997). Even though geographers have not made much contribution to this approach, the very clear epistemological interest in geography is linked with the geographical elements associated directly or indirectly as components constituting the traffic system. Explanations in the system approach to the study of road traffic accidents are based on man-environment adjustments and maladjustments. The main components /subsystem of the traffic system are: 1) The environment, comprising the road system and the wider physical and built-up environment. 2) The means of transport to facilitate mobility of people and goods, comprising the volume and quality of vehicles on the modes of transport. 3) Human behaviour, comprising the social-demographic characteristics of road users and their general behaviour on street.

Traffic risk, health risk, fatality rates and fatality risks are some of the common indicators used to explain the magnitude of road traffic accidents based on system approach to the study of traffic accidents. The methods used to calculate these independent variables in social science are essentially the same as those in natural science (medicine, epidemiology etc.).

Behavioural adjustment/adaptation is another example of a science-based approach to road safety countermeasures that can be experienced and experimented. Even though an extreme version of behavioural adaptation or risk cultural approach (refer theoretical chapter) have some reservations concerning the exactly evidence of behavioural adaptation (Sivak & Tsimhoni, 2008), there is

experimental evidence that drivers adjust their behaviour in response to perceived changes in risk in different environments (Sivak & Tsimhoni, 2008).

For instance, in this study, risk perception is operationalised by variables and the level of risk that respondents perceive is measured by rating a scale (refer methodology chapter). Different statistical methods are applied: exploratory factor analysis for measuring variables to an index. For example, Cronbanch's alpha for estimating test reliability, measuring internal consistency and regression analysis for examining the relationship between specified set of predictors and a dependent variable. These statistical methods are essentially the same as applied in natural science.

Ontological naturalism focuses on what exist and what does not exist (Elster, 1994). Modern science emphasises the importance of the observational evidence as the basis of scientific knowledge (Cousins, 2002). When a scientist claims to know something, that claim can be justified or warranted in terms of observation, experiment and in the collection of data (Creswell, 1994). Some philosophers hold that quantitative empirical evidence is the only valid evidence that can be used in the certification of scientific claims as knowledge. This kind of thinking is known as empiricism. Although empiricism can take several different forms, they all give epistemological primacy to evidence from experience.

Hypothetically, if driving exists obviously accident risk exists and the total harm of traffic accidents can be experienced and calculated into real (Jacobs & Bugaley 1995). Empirical evidence of the total harm from traffic accidents can be conceptualised as a product of exposure, risk, and consequences (Sivak & Tsimhoni, 2008). Exposure is a probability of the particular, potentially risky event given by a condition or situation of a given environment per distance travelled or per unit of time. Risk is the conditional probability of a crash, given the event in question. Consequence is the conditional probability of undesirable outcomes such as fatality, injury or property damage, given a crash that was precipitated by the event in question. Therefore, for each event the value along the three dimensions. Exposure, risk and consequences, defines a three-dimensional space. The volume of this space is the total harm for this particular event (Sivak & Tsimhoni, 2008)

2.2.2 Realism and road traffic accidents

Realism is a philosophy of science that uses abstraction to identify the necessary causal powers and the conditionality of structures that are realised under specific contingent conditions (Holt-Jensen 2001). Realism seeks to recover the connections between different dimensional domains in order to identify the relations between structures, mechanisms and events (Lawson & Staeheli, 2005). Structure is a fundamental and sometimes intangible notion covering the recognition, observation, nature and stability of patterns and relationship of entities (Sayer 1992).

The system approach to the study of traffic accidents comprises independent structures such as means of transport (vehicles), environment (roads) and people (road users). These structures are interrelated and depend on each other in the causation of an event (accident), and defines what a traffic system is made up. The system approach to the study of traffic accidents is empirically naturalist (Elvik & Vaa, 2004). This implies that its application in social science is essentially the same as that in the natural sciences. In this context, realism shares a number of views with positivism, especially on knowledge of causal relations that render traffic accidents more predictable and understandable. Realism and positivism to some extent disagree on the nature of causation. According to positivists, causation is about constant conjuncture, that is saying, A causes B or A causes B to do C, or under certain specific condition, if A happens then B happens or B does C in a regular and predictable fashion. For positivists, there is nothing more meaningful that one can say about causation and science is simply a practice of observing and recording these constant conjecturers (Sayer, 1992).

The realist view about causation accepts that there can be causation without regularity; what causes an event has nothing to do with the number of times it has been observed. Unique events are caused no less than repeated ones ((Jones & Moon, 1992) It is not enough to explain accident causation by using constant conjunctures. Even though road traffic accident analysis is commonly based on vehicle factors, environmental factors or human factors, the causation of accident based on these factors are not constant (Elvik& Vaa, 2004).

Accidents as malfunctions of traffic system cover a wide range of combinations where probabilities and consequences are concerned: from minor accidents that happen now and then, to highly improbable failures resulting in serious injuries (Berdica, 2002). Some factors contribute to the occurrence of a collision and are therefore part of accident causation (Krug, 1999, Peden et

al 2004). Other factors aggravate the effects of the collision and thus contribute to trauma severity (Peden et al 2004). Some factors may not appear to be directly related to road traffic injuries (Krug, 1999). Some causes are immediate, but they may be underpinned by medium-term and long-term structural causes (such as physical and social cultural environment (settings)) (Muhlrad & Lassarre, 2005).

Causation according to realist thinking is not only about A follows B, but also considers some other mechanisms which necessitate the link between A and B or something about the nature or essence of A and B which constitute the causal relations between them. Science offers theoretical account of these mechanisms, essence and nature. In this case, the realist school of thought provides a relevant base of knowledge, when it comes to the selection of relevant theory that can explain and guide the analysis of causation factors associated with components of the system in the traffic system.

Causation according to realists is based on scientific explanations that refer to essence, entities and mechanisms that are unobservable now but could become observable at a later point (Jones & Moon, 1992). For instance, driving a car with fatigue, or under the influence of alcohol, or under medication, is may be difficult to observe but may contribute significantly to the accidents and severe injuries. Scientific explanations can provide information about mechanisms, essence and nature of these factors in order to theorise their existence and let them be recognised or perceived.

One of the bases of realism is that we have structures in the real world that are found in the form of experiences and conceptions in people's heads, which cannot be observed or measured directly but which are bases for actions, and in this way shape events in society (Holt-Jensen 2001). A useful realistic approach in the study of traffic accidents is that: 1) It allows formulation of scientific models that can be used as a framework for understanding the multiple causes and prevention of traffic accidents. 2) Accidents can be stratified into empirical, actual and real by the explication of explanatory causal mechanisms. 3) It recognizes the mechanism of risk factors associated with traffic accidents in the real domain.

The potential of realism in the system approach is that it links different levels of theory, grounded, middle range and grand theory in multi-strategy research and multidisciplinary research such as road safety studies. It suggests the investigation of the underlying mechanisms and structures of

social relations, and identifying the building blocks of reality (Kitchin & Tate, 2000). One of the major problems of road safety evaluation research is that, most research on road safety does not have a strong theoretical basis, guiding the design of the studies and interpretation of such findings (Elvik, 2005); as such, a link and coordination mechanism with other theories is necessary.

Contemporary realists argue that a great deal of criticism of realism relies upon epistemological rather than ontological argument. Realism is opposed to certain varieties of constructionism, and claims that it is a philosophy about what exists rather than what we can and cannot know. The critique is mainly epistemological arguing against the view of constructionists that, human knowledge is not simply a reflection of the world out there, but rather depends upon what the knower him or herself brings to a situation, in other words human knowledge is actively constructed. The main response of the modern realist stand against constructivist is that the existence of the world and our knowledge of it may be two different things. Because the structures creating the world ontology cannot be directly observed and the appearances do not necessarily reveal the mechanisms, which cause these appearances epistemology and its methodology, therefore involves the construction of theories that may account for these appearances.

In the study of road traffic accidents, the philosophy of realism offers a simultaneous critique of both positivists and purely constructivists' approaches to the study of road traffic accidents. Positivism can only offer description of surface structures or physical factors, e.g. vehicle, road, or people as constant conjunctures contributing to the cause of an accident, but cannot offer adequate explanations of the mechanisms of the structured factors. Constructivism provides a superficial understanding of the evident cause of an accident but it does not go further in to other hidden contributing factors. Constructivism is based on human actions and understanding of a particular scene; for instance an accident scene can be assessed based on immediate cause such as 1) Speeding, perilous overtaking; 2) Alcohol and drug abuse; 3) Driver negligence, poor driving standards; 4) Vehicle overload; 5) Poor maintenance of vehicles; 6) Bad roads and hilly terrain; 7) Negligence of pedestrians; 8) Distraction of drivers (e.g. speaking on cell phones). However, they cannot go further to assess, for instance the rapid growth in motorisation and human population, increased spatial interaction of road traffic in terms of the volume and direction of movement. Deficiencies and problems in road user behaviour, conditions and environment of work in the public transport sector, social and economic conditions prevailing in may be Sub-Saharan Africa,

serious deficiencies in the road network development and maintenance, and deficiencies in road safety planning, management, enforcement and interventions.

Realism recognises that knowledge about a certain phenomenon can only be achieved through the study of human conceptions and that human practices cannot be understood only as rational and functional, but, must also work meaningfully for the people involved. The philosophy of "human centred approach" in the study of road traffic accidents has emerged dominant in several disciplines in social sciences (Thompson & Rivara 2002). For instance, road traffic accidents in light of system approach. The most applied approach is based on a premise where individual road users are solely responsible when an accident occurs. In this case, countermeasures are aimed at altering the behaviour of road user in order to adapt him to the traffic system. Researchers in developed and developing countries conclude the obvious fact that human error constitutes the highest percentage of all road accidents and only small proportion of accidents can be directly attributed to vehicle performance including defects or faults, and roads themselves including their design or maintenance (Odero et al., 2003).

2.2.3 Marxism and road traffic accidents

Marxism is the political philosophy and economic worldview based upon a materialist interpretation of history (Elster, 1994). Marxism is a particular way of interpreting the world, which is often called historical materialism (Føllesdal, 1994). The main focus is the material conditions of human existence (Hollis, 1994). A central Marxian social theory is the mode of production that characterises a society (Taylor, 1994). Marxism, like positivism, is not a static set of ideas, there are many classical works that have been reinterpreted and modified. Some of these have been developed specifically to suit perceived problems in the classical formulations, but all share this as a common point of origin (Hollis, 1994).

The Marxist school of thought can be applied to understanding the status of the system of traffic rules regulation and controls in a country. The trend of road traffic accidents worldwide indicates that, the magnitude of the problem is decreasing in high-income countries and increasing in low-income countries (WHO, 2013). This implicates some general features of Marxism`s theory of economic transformation which influence simultaneously the improvement of other social problems as well as road traffic accidents. It is possible to generalise that improving economic

situation in low-income countries will also improve other preventable health problems such as road traffic accidents.

Smeed (1949; 1968) indicated that; when the society approaches a certain level, traffic accidents, motorisation and material prosperity (income level), strong social (cultural) forces and mechanisms to reduce traffic accidents through the institution of a safety culture will come in to play (Smeed 1968). Smeed is the first person to conduct a comparative study of fatality rates associated with traffic accidents in different countries. The main argument: the level of economic development and motorisation determine the rate of motor vehicle injuries risk awareness. (Smeed 1968).

Marxist philosophy/approaches to the study of road traffic accidents signifies also the relevance of political and economic factors in understanding the operation of traffic system at different societies and environment. Politics and resources are essential tools for the strategic responses to risk associated with traffic accidents. Political tools refers to 1) decision making, and power relations for the management of the traffic system, 2) road safety vision and mission to achieve, 2) organization of road safety policies, rules, regulations and controls, 3) implementation of road safety measures, 4) professionalism, 5) participation and 6) distribution and allocation of resources.

Safety culture (enforcement mechanisms, safety policies, appropriate traffic control, and social organisation of safe traffic system) arises when the public recognise accidents as a potential risk source to their environment (Amalberti, 2001; Zein & Navin, 2003). Safety in a place is socially and culturally constructed and regulated within parameters of social rule systems (politics) that govern a particular society (Dekker, 2002). Social rule systems include institutions such as norms, laws, regulations, taboos, customs, and a variety of related principles in place.

2.2.4 Behaviourism and road traffic accidents

Behaviourism is one of the philosophical methodologies in human geography that is concerned with micro scale exploration of the behaviour of individuals or groups in place and space (Burton & Kates, 1964; Chapin, 1974; Cullen, 1976; Golledge & Stimson, 1997). The approach focuses more on the cognitive processes underlying spatial reasoning, decision-making, and behaviour (Golledge & Stimson, 1997; Kitchin & Tate, 2000). In a specific way, it makes use of the methods

and assumptions of behaviouralism to determine the cognitive processes involved in an individual's perception of, and/or response and reaction to their environment.

The philosophy of behavioralism maintains that human-environment relations are dynamic and bidirectional: The actions and mental states of individuals cause, and are caused by, physical and social cultural environments, within the context of ongoing and changing interactions (Golledge & Stimson, 1997). As such, behaviouralism seeks to model spatial behaviour through the measurement of people's ability to remember, recognise, understand and evaluate geographic information such as extreme environmental events or hazards/risk.

Geographic research on people's reaction to extreme environmental events or hazards/risk indicates that, human actions or reactions are grounded in their perception, attitudes and beliefs such as culture, religious, social or political worldviews developed towards the situation in a place (Golledge & Stimson, 1997). In this context the philosophy of behaviouralism has inherent interdisciplinary connections, particularly with subfields of psychology and other behavioural and cognitive disciplines, such as linguistics, anthropology, economics, artificial intelligence, environmental disciplines (such as planning, architecture) and urban studies (Cullen, 1976; Golledge & Stimson, 1997). The factors influencing the characteristics nature and structure of the perceptions, attitudes, beliefs and behaviour of individuals towards the environment (sense of how things are recalled and practices) lie firmly in the realm of a psychological range of interpretations (Fishbein & Ajzen, 1975; Datel & Dingemans, 1984; Golledge & Stimson, 1997).

2.3 Risk approach in Human Geography

Geographers have traditionally referred to hazard or risk "perception" rather than cognition. According to Jorgensen (1996): 1) the concept of risk has developed with no discipline as authoritative, 2) the subject of risk is multidisciplinary field, 3) different schools have emerged in understanding and structuring the studies of risk, and 4) some of the professional disciplines, such as epidemiology, engineering, and psychology, have established their inherent paradigms. A common agreed upon definition of risk is yet to be articulated (Breakwell, 2007). Risk can for instance be defined as subjective assessment of probability for a specific occurrence of a negative event, and how concerned the individual is with the consequences of this event (Sjorberg & Biel,

1983; Rundmo & Iversen, 2004; Moen & Rundmo, 2005), thus the combination of perceived probability and severity of consequences relate to how the individual perceives risk (Breakwell, 2007).

Cited in Jorgensen (1996) presents a fruitful typology of the risk. Renn has systematized dominant risk perspectives by their assumptions and methodologies as well as their different function. Table 2.2 gives a simplified and summarized illustration of seven perspectives, identifying their associated methods, scopes, problem areas and other characteristics.

Table 2.2 Systematic classification of risk perspective

Approach: Characteristics	**Actuarial**	**Epidemiology**	**Probabilistic risk analysis**	**Economics of risk**	**Psychology of risk**	**Social theories of risk**	**Cultural theories of risk**
Base unit:	Expected value	Modelled value	Synthesized expected value	Expected utility	Synthesized expected value	Perceived fairness	Shared values
Method:	Extra-polation	Experiments Health survey	Event & fault Tree analysis	Risk-benefit analysis	Psycho-metics	Surveys structured analysis	Grid-group analysis
Scope of risk	Universal	Health & environment	Safety	Universal	Individual perception	Social interest	Cultural crusters
concept: dimension	One-dimension	One-dimension	One-dimension	One-dimension	Multi-dimension	Multi-dimension	Multi-dimension
Basic problem areas	Averaging over space, time and context			Preference aggregation		Social relativism	
	Predictive power	Transferability intervening variables	Common mode failures	Common denominator	Social relevance	complexity	Empirical validity
Major application	Insurance	Health Environmental protection	Safety Engineering	Decision Making	Policy making, regulations, conflict resolutions and risk communications		
Instrumental function	Risk sharing	Early warning Standard-setting	Early warning Improving-system	Resource allocation	Individual assessment	Equity & fairness Political-acceptance	Cultural identity
Social function	Assessment		Risk reduction and Policy selection			Political legislation	

Source; A simplified version after Renn, 1992 cited in Jørgensen, 1996.

This systematic classification of risk perspectives (table 2.2) is exemplified using traffic risks and every day risk activity connected with driving a vehicle or crossing a street (Jorgensen, 1996).

According to Jørgensen (1996) in geography, as in other discipline, the risk concept appears incoherent and the risk perspectives have different connotations. Jørgensen pointed three

directions that deal with risk aspects in geography; 1) medical geography (corresponding to epidemiology); 2) applied geography and planning (bearing connections to probabilistic risk analysis); and 3) the hazard-tradition (with connections to physical geography as well as social theory and cultural theory).

Actuarial, epidemiological and probabilistic risk analysis can all be classified as technical risk analyses. The actuarial approach implies calculating expected values of undesirable outcomes such as the number of traffic accidents, which can be objectively measured. When overcoming problems with sufficient statistical data and stability in the factors causing negative event, this gives one-dimensional, valid prediction of risk assessment as an average over space, time and context. Jorgensen (1996) gives as an example from a car insurance company calculating probabilities based on the age of the driver, type of vehicle etc. and sometimes even the driver's place of residence.

The epidemiological approach is related to the actuarial. Accident risk causalities are made explicit by modelling associated potential factors. Probabilistic risk is concerned with prediction of safety and risk based on complex technological systems, such as traffic system in which accident is attributed to driver, environment and vehicle related failures. Social scientists Douglas (1985) and Beck (1992) criticized the technical approaches on the grounds that, the technical analyses ignore social aspects, cultural experience and context, whereas the economic, psychological and cultural perspectives regard social process in their studies of risk and their causes and consequences.

The economic approach of risk is part of a more comprehensive cost-benefit analyses and risk is expressed as subjective (dis)utility, which allows all measurements of all types of consequences– technical, psychological, social and cultural. Within the psychological perspective, contextual variables play an important role in individual risk estimation and evaluation; this contains aspects such as personal beliefs, driving skills, safety awareness. Social theories are heterogeneous in the scope of sociological studies. They reflect different ideologies and competing paradigms. Thus with respect to traffic risk, social theories and cultural theories of risk can highlight different subcultures which share different group values and beliefs on risky traffic behavior (e.g. high speed can be expressed in an alternative context as a symbol of freedom, symbol of power etc.).

2.4 Verifying road user behaviour in Human Geography.

The largest number of studies primarily from within psychology focus specifically on individual factors as the locus of behaviour (Brown, 2001; Colman, 2009; Gazzaniga, 2010). In geography and other social science disciplines such as sociology and anthropology, behaviour is modelled based on individual factors in relation to their physical and social cultural environment in which they occur (Norton, 2001, 2002; Glass, 2007).

Behaviour analysis is multi-disciplinary in nature (Smelser & Baltes, 2001; Levitis et al., 2009; Flint et al., 2010), and the aspect of modelling factors influencing behaviour emanate from all disciplines in the social and natural sciences (Armitage & Conner, 2000; Heimlich, & Alboin, 2008; Forward, 2009; Petticrew et al., 2012). Indeed, in many ways disciplinary boundaries simply serve to demarcate the types and contexts of behaviour factors in which scholars are interested and the methods by which they might be studied (Dolan, 2010; Michie et al., 2011). In this sense, attempts have been made to develop models relevant to serve specific disciplinary variable/factors in explaining human behaviour in its specific contexts (Friedman & Rosenman, 1960; Rutter & Quine, 2002; Heimlich, & Alboin, 2008; Webb et al., 2010).

In psychology, Ajzen & Fishbein, (1980) and Ajzein (1985, cited in 2001 version) suggest that the likelihood for an individual or a group to engage in a specific behaviour is predicted by attitude` related factors, norms and belief` related factors regarding such behaviour and perception of control as another predictor of behaviour. This has been tested extensively in relation to traffic safety studies (Paker et al., 1992; Åberg, 1993; Iversen, 2004; Iversen & Rundmo, 2004; Eiksund, 2009). These studies have mainly supported the idea that perceptions, culturally related beliefs and attitudes are significant predictors of driving behaviour.

In geography, the core interest in analysing road user behaviour is focused on the importance of the physical and social cultural environment (man-environment adjustment and maladjustment). A geographical perspective assumes that, individuals perform or reproduce behaviours that are themselves a product of relationships between people, their environment, and the technology that surrounds them. (Golledge & Stimson, 1997). The physical environment such as place of residence or driving environment and social cultural environment such as space activities such as politics) play an important role in the understanding of road user behaviour.

Even though individuals subjective risk judgment based on geographical perspective is more focused on socio-cultural approach in relation to environmental factors, likewise the paradigm of psychometric approach and other disciplines also, to most extent, coincide with a population composition way of thinking on area effect (Lupton, 1999; Winter & Dodou, 2010).

Each road user is an individual influenced by the social environment consisting of other road users, general social norms, traffic related rules of conduct, and their representations (Parker et al., 1995). At the same time, each road user is also sharing in the collective adjustment of the environmental settings (Mann & Sullman, 2008). Therefore, an individual`s subjective risk judgment could be amplified or influenced through interaction with other individuals and their collectives, social norms, social values, location, social status and their internalized culture of a place (Douglas, 1985).

2.5 Verifying spaces of urban-rural context

The geographical contexts of urban-rural difference are interesting for analysing road user behaviour and accident incidences on traffic. Many studies have indicated a significant geographical variation in road accident incidence and the variation is spatial and related to changes in intrinsic risk and risk exposure (Whitelegg, 1986: Chin & Quek, 1997: Elvik and Vaa, 2004: Jørgensen, 2004: Eiksund, 2009). For instance, Packer et al (1995) and Iversen (2004) found that attitudes and behaviour are strong predictors of differences in traffic system risk in urban and rural areas. Eiksund (2009) concludes that local differences in safety culture in rural and urban areas, contributed to differences in driver behaviour. Rakauskas et al. (2007) showed that drivers in rural areas were significantly less likely than urban counterparts, to use safety devices such as seat belts and they were more willing to drive while under influence of alcohol. The physical characteristics of rural traffic environment facilitate more risky driver behaviour (Jorgensen, 2004; Rakauskas et al. 2007). According to Jorgensen (2014), in rural areas there are generally higher speed levels and lower traffic density, which may challenge driver's levels of attention and generate fewer but more serious accidents.

Geographically, people living in urban areas experience; high population density, high traffic congestion, high number of pedestrians, high number of motor cyclists, high number of bicyclists, several road signs, different types of roads (such as; one way, two way, low speed, high speed.

Junctions, roundabouts, with lights and without etc.), diverse settlement patterns with different characteristics such as high density and low density residentially, complex business pattern such as shops, markets, garages, industries etc., high number of public areas such as schools, play grounds, religious areas, parking areas etc. All these spaces are connected through a road network system. On the other hand, rural residents experience low and scattered population density, very low and sometimes no traffic congestion, most road users are pedestrians or cyclists. There are very few road signs and sometimes no road signs especially in remote areas where the settlement pattern is dispersed, there tend to be very few road accidents, but most of them are fatal. People living in semi-urban areas experience an average traffic conditions between the urban activity system and the rural activity system. Traffic in semi-urban areas appears to have a balance between the number of vehicles operating, road space and population demand. Semi-urban environments are more connected to urban than in rural.

A possible explanation for differences in accident severity and risk judgement across rural and urban areas could be that the relative low density of vehicles in rural areas facilitate more speeding among drivers. It is also likely that a lower traffic volume in rural areas could reduce the level of accident risk perception (Nordfjærn et al. 2010). In addition to physical traffic environment, studies indicate that variables such as demographic characteristics and personality variables may influence subjective risk judgement and traffic behaviour (Ulleberg, 2002; Oltedal & Rundmo, 2006). Such human factors have also been investigated and compared between different countries (Lund & Rundmo, 2009; Nordfjærn et al., 2010). However, according to Nordfjærn et al. (2010) few studies have considered these variables when examining traffic risk in rural, semi-urban and urban within specific countries.

In general, spatiality (spatial variation) is an important part of geographical imaginations (Flowerdew & Martin, 2005), in which the role of space and place is recognized in determining the magnitude, scale, pattern and tendencies for various phenomena (Cutter 1993: Agnew, 2002: Elvik & Vaa 2004) of traffic related risk in relation to exposure related risk (system risk). From a geographical perspective, exposure related risk could give indications of overall traffic characteristics of a place that could be linked to local values, norms, and personality traits for instance population groups in Tanzania and other cultural traits (urban or rural background). In addition, identification of differences in risk perception, risk attitude, risk willingness and risk

taking behaviour in rural, semi-urban and urban areas may ultimately provide information that could result in more context-specific countermeasures.

2.6 Population composition in a place

One of the important applications of the philosophy of behaviouralism to the study of road traffic accidents is the prediction of individual differences in accident involvement (Deffenbacher et al, 2003). Behaviouralism recognises that, people differ in many ways that have implications for behaviour in space and place (Fischer, 2000; Wood & Eagly, 2002). Furthermore, behaviouralism as a philosophical methodology promotes the systematic study of these variations at the level of the individual person, and can be aggregated according to many different variables, such as sex, gender, age-group, ethnicity, social class, residential environment, level of income, intellectual abilities, educational background, language, and many more (Norton, 2002; Glass, 2007). The risk of fatal traffic accidents varies between urban and rural areas. Behaviourist suggest, these differences could be attributed to the context of the areas (such as physical and social cultural environment) or to the composition of demographic characteristics by these geographical areas (such as gender, age groups, education etc.).

2.7 Spaces of religion and human practice (Historical hermeneutic)

Traditionally, the relationship between geography and religion can be seen by the influences of religion in shaping cosmological understandings of the world (Park, 2004). Other traditional approaches to the study of the relationship between geography and religion involved theological explorations of the workings of nature (Kong, 1990; Peach 2002). Thus, geographers are less concerned about religion per se, but are sensitive to how religion as a cultural feature (worldview) affects social, cultural, political and environmental systems (Knot, 2005; Kong, 2010). The point of focus is not the specifics of religious beliefs and practices, but how these religious beliefs and practices are internalised by adherents, and how these processes of internalization influence, and is influenced by, social systems (Park, 1994)

Religious belief is among the silent but very important factors to be recognised for effective road safety strategies, specifically in low-income countries. Religions provide moral strength or the qualities that make up a person using the roads in the traffic system to a certain trend of risk

perception, risk attitude and risk taking behaviour associated with traffic accidents. Indeed, religious values manifest manners in which religious people are bound to oblige. In other words, it is the combined moral or ethical structure of a person or group. Belief determines character and inclination because a person's disposition is largely shaped by his/her conviction.

Several studies in Western countries have examined the association between religious belief and human practice, most of these studies revealed a connection (Durkheim, 1976; Geertz, 1993; Kim, 2001; Jones, 2004; Giddens, 2006; Ellwood & Alles, 2007). Durkheim (1976) pointed out three major functions of religions that shape human practice (behaviour) and operation of the society (culture): 1) *Social cohesion*, religion unites people through shared symbols, values and norms. Religious doctrines and ritual establish rules of fair play that make organized social life possible. 2) *Social control*, every society uses religious imagery and rhetoric to promote conformity. Societies infuse many cultural norms with religious justifications. Religion confers legitimacy on the political system. 3) *Providing meaning and purpose*, religious beliefs offer the comforting sense that the vulnerable human condition serves some greater purpose. Strengthened by such convictions, people are less likely to collapse in despair when confronted by natural and technological calamities or hazards such as road accident causalities.

In general, social cohesion is to unite people with common accepted values in a society. For instance, impatience on the road by either drivers or other road users is considered moral or ethical defect in a society. It implicates faithless or lawless society. Impatience is synonymous with lack of self-control. No cultural or religious grips on this virtue. Lack of self-control manifests itself in a variety of ways such as over speeding, wrong overtaking, indiscriminate parking, and so on.

Religion has a potential link to influence road user behaviour: 1) In form of culture. Religion in form of culture links directly to road user's behaviour. People with religion faith consist of shared beliefs, values, norms, and ideas that create a common identity and practices (Harvey, 2000: IRF, 2007). Religion in this form can provide a set of values considered as a worldview in which members may adapt or use as a right conduct on traffic. Several studies have associated religion as a cultural system and the way people adapt to their environment (Geertz, 1993: Jones, 2004: Balter, 2005: Giddens, 2006).

2) In form of civil society. Religion in form of civil society has a potential opportunity to influence behaviour of both members and non-religious members (Knack & Keefer, 1997: O'Connell, 2003:

Ferragina, 2010). They own schools in which road safety is taught, and they own private hospitals in which accident patients are treated, and conduct the rehabilitation schemes for changing behaviour related to effect of drugs and alcohol while driving.

3) In form of ritualized practices. Religion in form of ritualised practices influence people to believe that, the use of religious gestures, words, posters and objects, in a stereotyped sequence of activities is one way of inviting preternatural forces to guide or protect any related harm or risk (Smith, 1962: Durkheim, 1976: Geertz, 1993: Brodd, 2003: Giddens, 2006). This is indeed experience in transport systems, some use biblical words stamped onto vehicles and some hang rosaries in their windscreens. This indicates transfer of religious information, religious values into driving practices.

Most forms of religions and religious values experienced in a society indicate to be relevant factors significantly in transforming other worldviews such as superstitious beliefs and could probably be used to help people to rely on good judgment while on the road. Religious values suggest patience, maturity, obedience of rules and regulations, tolerance, road sense, and maintenance of safety culture (Giddens, 2006).

2.8 Geography and epistemology of System approach to the study of traffic accidents.

To understand the system approach and how it works, we need to understand what system means. There are many definitions of a system (Midgley, 2003; Salmon et al. 2012). Ashby's (1970) definition, cited on Leplat, (1984) is one of the most general and consistently used by several researchers: he considers that to define a system is to list the variables that are to be taken into account. This apparently banal definition underlines that it is indispensable in every case to list precisely the variable or elements constituting the system considered. A system is indeed always a model, and abstraction conceived by the analyst (Erdogan et al 2007).

Midgley (2003) has defined system as an organized collection of parts (or subsystems) that are highly integrated to accomplish an overall goal. The system has various inputs, which go through certain processes to produce certain outputs, which all together accomplish the desired goal for the system. Systems range from simple to complex (Midgley, 2003). There are numerous types of systems, including human/mechanical system (for example, driving a car or riding a bicycle).

Complex systems usually interact with their environments and are, thus, open systems. A high-functioning system continually exchanges feedback among its various parts to ensure that they remain closely aligned and focused on achieving the goal of the system. If any of the parts or activities in the system seems weakened or misaligned, the system makes necessary adjustments to more effectively achieve its goals (Bailey, 1994; Jenkins et al. 2010).

The explanation of a system approach to the study of road traffic accidents in geography is based on man-environment adjustments and maladjustments. Traffic accidents bear strong elements of man-environment adjustments and maladjustment (Muhlrad & Lassarre, 2005). It is extremely difficult to form an impression of exactly or precisely elements that can explain the traffic safety or traffic accident system (Leplat, 1984; Nilson, 2004). Midgley (2003) suggested that, the purpose or the overall goal of the system can propose what should be subsystems affecting the system.

Ashby's (1970) cited in Leplat, (1984), recommended listing of relevant main variables (for instance main factors, components or elements of traffic system such as roads, vehicles, and road users) in order to explain better what a traffic system is. OECD (1997) suggested that modelling of safety levels relative to factors assumed to affect road safety is therefore important and significant. Therefore the use of models helps in summarising information and facilitates communication between researchers, design, and evaluation of safety measures (OECD, 1997).

Models are simplified versions of a concept, phenomenon, relationship, structure, system, or an aspect of the real word (Aitkin, et al., 1989, OECD, 1997). The main objective of formulating a model (modelling) are; 1) to facilitate understanding by eliminating unnecessary components; 2) to aid in decision making by simulating "what if scenarios" ; 3) to explain, predict and control events on the basis of past observations (Larson et al, 2010).

Hakkert and McGann (1996) identified three broad groups of road accidents and safety models, namely macro-models, meso-models, and micro models. Macro models describe the road accidents or safety situation at a highly aggregated level typically using national accident statistics overtime and give minimum, if any, explanation of the changes over time. The earliest models were based on accident data for the 1930s for 20 countries (Smeed 1949; 1968). More data that are extensive confirmed the Smeed formula (Smeed, 1968). The Smeed formula is used to rank countries by accident rates over time and make comparisons between countries. These models are

meant for ranking the magnitude of the problem by comparing different places (Country to country, or region-to-region). They are not meant to give explanations of a specific cause in a specific area.

Meso-models relate aggregate accident statistics to explanatory factors. Such models typically use explanatory factors subject to policy intervention. A model for road traffic accidents by Jørgensen & Abane (1999) provide an example. The models suggest important factors contributing to cause of road traffic accidents. These models reflect general consideration of multi causal factors and therefore insist on reinforcement mechanisms in order to reduce accidents or improve safety. The meso models are the most relevant in geography and other social studies.

Micro-models describe the relationship between the number of accidents or causalities and a specific aspect of road safety. They usually treat a part of the road safety system. For example;

The relationship between the number of accidents and road geometry for a given road class or traffic flow for a given junction type. The micro models are the most relevant in engineering practice (Leveson, 2002).

CHAPTER THREE

Theoretical perspectives of the study

3.0 Introduction

In the early stages of motorisation, road safety measures did not take rigorous scientific research to achieve major improvement in traffic safety (Sivak & Tsimhoni, 2008). Instead, early traffic safety countermeasures were often based exclusively on common sense (Leveson, 2002). The phenomenon of traffic accident was considered either an act of God or unavoidable consequences of modern life (Sheller & Urry, 2000; Vasconcellos, 2001; Leveson, 2002; Salmon et al. 2012).

When traffic fatalities increased to high level and became as damaging as contemporary illnesses, traffic accidents were no longer viewed with fatalistic attitude, or as a question of fate, but a consequence of human actions (Vasconcellos, 2001). Therefore, they could be prevented (Leonard, 2004; Lu et al. 2007; Peden et al., 2004). Since then scientific research has gradually increased in importance as the basis for developing successful interventions (Smeed, 1949; 1968; Wilde, 2002; Elvik & Vaa, 2004; Elvik, 2008).

The scientific approach to road safety in recent decades has evolved from blaming the victims to safe systems (Elvik, 2001; Johnston, 2009; Salmon, 2012). Blaming the victims (blame worth human behaviour (Fuller, 2005)) has given the way to strategies emphasizing a system approach to intervention (Elvik, 2008; Salmon et al., 2012). Safe system approach embraces improvements in road infrastructure and vehicle safety, legislation, enforcement of laws, and controls to ensure road users' compliance with safety measures.

This chapter describes: 1) An overview trend and practices of road safety research that has evolved to safe system approach. 2) Four theoretical approaches with relevance to geographical perspectives chosen to guide the study: 1) System approach guided by a heuristic model of safe traffic system, 2) Risk theory and cultural approach. 3) Political ecology approach and 4) Modernisation approach.

3.1 An overview trend of road safety research and practice

Massaoe (2000) presented an overview trend of road safety research and practices based on OECD (1984), Ogden (1996), Mikkonen (1997) and OECD (1997). The trend was analysed based on five paradigms. Massaoe (2000) defined the paradigms as the underlying way of thinking or prevailing premises and beliefs that influenced road safety research and practice at different periods during the century. The main points of the paradigms are summarized in Table 3.1. Mikkonen (1997) suggested that the fifth paradigm that will be characterized by intolerance of serious accidents in the highly industrialized countries is likely to dominate research and practice at the beginning of the 21st century. Tingvall (1997), Mackay & Tiwari (2005) and Larson et al. (2010) also support this idea. Other researchers recognised the fifth paradigm as a shift in focus of road safety research and practice from controlling the vehicle at the beginning to controlling the transport system as a whole (Amalberti, 2001; Emmerik, 2001; Skyttner, 2005).

This historical evolution summarised from Massaoe (2000, page 11-13) indicates that progress in the reduction of road trauma came about as a result of abandoning the "cause and blame" attitude that were prevalent before the 70s (Ogden, 1996; Zein & Navin, 2003). This attitude was fostered by the concept accident proneness that came from the analysis of industrial accident data by Greenwood and Yule (1920). This concept was spurious and counter-productive (OECD, 1984; Evans, 1991; Dekker, 2002; Dekker et al. 2011) as all efforts to identify accident-prone drivers *a priori* were not successful (Haight, 1986; Elvik, 2010). Nevertheless, as long as the authorities responsible for regulations of transportations and the providers of the infrastructure and vehicles focused on blaming the "accident victim" they were absolved from the necessity to do anything (Ogden, 1996).

Table 3.1 Historical-Conceptual Overview of Development in Road Safety Practice

1	**Transport Entity Management (1900 to 1925/35)** ***Controlling the vehicle*** • The vehicle should not behave differently from the horse-drawn carriages. • Main feature was regulation and enforcement. • Drink driving enforcement. • Follow up road safety inspections
2	**Traffic Incidences Management (1925/35 to 65/70)** ***Focused on the Control of Individual Situations in Traffic*** • The doctrine of "**Three E, s** ". It was assumed that if cars and roads (**E**ngineering) were operational, traffic participants were **E**ducated and **E**nforcement compelled all road users to follow a common code safety would improve. • The concept of accident proneness characterized this epoch • Both theory and practice were based on the idea that accidents indicated imperfect management of traffic situations. No real connection between theory and practice.
3	**Traffic System Management (1965/70 to 80/85)** ***System approach; controlling the traffic system as a whole by removing risk factors and minimizing the consequences of accidents.*** • Research to clarify causes of accidents, mainly in-depth multi-disciplinary investigations, revealed that the human being is an unreliable operator in the traffic system. It was also evident that typical mistakes made by road users were common to many of them rather than to some of them. • Mathematical models used to identify essential features from accident statistics. • Use of traffic conflict and behavior observations to supplement accident data • Systematic introduction of safety measures including speed limits, safety belts, alcohol/driving law, vehicle safety standards and infrastructure improvement measures (black spots treatment) NB: The system approach does not give any real theory for the system as a whole
4	**Transport System Management (1980/85 to 2000/05)** ***Control of Exposure to accidents has a distinct role in road safety work.*** • Management of transport demand through pricing/restriction and safety sensitive land use planning. Road safety made integral part of transport policy. • Integrated, targeted road safety programs, usually combined with environmental goals. • Design of car front to protect pedestrians. • Pedestrian bridge or tunnels.
5	**The Future Paradigm: Built in safety controls (2005/10 onwards)** ***Deployment of Intelligent Transport Systems (ITS) to prevent serious accidents and to minimize opportunities for road user mistakes.*** • Management of environment and vehicle by the use of automatic electronic equipment • The use of ALCO – LOCKER in all means of transport • The use of automatic speed limits (intelligent speed adaptation (ISA)) • Seat belt reminders. • Speed cameras

Source; Modified after Mikkonen, (1997), OECD (1997) and Massaoe (2000).

In 1925/35 to 65/70, the worldwide culture around road safety strategic thinking was based on the measures of one primary cause of an accident (Johnston, 2009; Salmon, 2012). Blame worth human behaviour factor (Fuller, 2005), and the counter measures were reactive, small scale, directed largely at symptoms and with a clear tendency to be punitive (Salmon et al. 2012).

In the 70s to 80s, it was realized that accidents are rarely the result of a single, unique cause but are rather an outcome of series of events. The UK Department of Transport acknowledge the multi-causal concept in its Accident Investigation Manual by defining an accident as "a rare, random, multi-factor event always preceded by a situation in which one or more persons have failed to cope with their environment (Ogden, 1996; Leveson, 2004). This definition implies that anyone involved in traffic is at risk of being involved in an accident. It also suggest that, accident prevention depend on identifying and rectifying the weakest link in the chain.

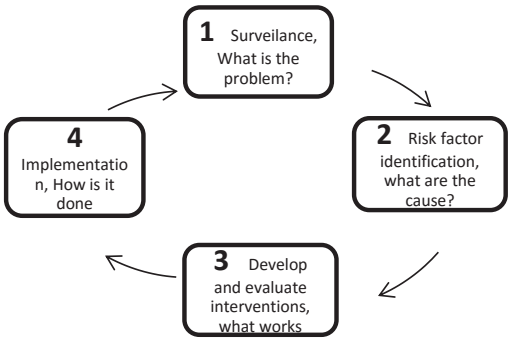
In a 1984 OECD report cited in Massaoe (2000), the view that, the occurrence of an accident is due to the breakdown in the interaction of the elements of the traffic system namely human-vehicle-road, resulting from any number of causes is referred to as "multi-causal chance phenomena approach". The causes are viewed as partly deterministic, hence controllable, and partly stochastic and therefore uncontrollable. Ogden (1996) noted that this approach led to the application of statistical techniques to help sort up the deterministic factors for treatment. He states that this approach led to great advances and it is essentially the state of the art. System approach dominated several researches in both developed and developing countries (Salmon et al. 2012).

As evidenced by the historical overview of road safety practice. The context of system thinking to the study of road traffic accidents have been dominating to a great extent in several years (OECD, 1997). System thinking emerged in 1920s as a response to the failure of mechanistic thinking to be able to explain social, socio-technical and biological phenomenon (Skyttner, 2005) The approach has inspired many scientific disciplines which, however quite often just borrowed some general concept from it (Leplat, 1984, Bailey, 1994, OECD, 1997).

For instance, in the field of public health, the surveillance, cause, magnitude and effects of road traffic accidents were studied by using a public health approach (Peden et al., 2004). A public health approach is a generic analytical framework used to respond to a wide range of health problems and diseases, including injuries and violence (Mercy *et al*, 1993, Krug, 1999). The

approach demands four interrelated steps to accomplish the system: 1) To determine the magnitude, scope and characteristics of the problem; 2) To identify the factors that increase the risk of disease, injury or disability and to determine which factors are potentially modifiable. 3) To assess what measures can be taken to prevent the problem. 4) The implementation of interventions that have been proven or are highly likely to be effective on a broad scale (Mercy *et al*, 1993).

Figure 3.1 The System of Public Health Approach. Source, Mercy et al 1993



Many scientists in social studies criticized the approach to be very general in analysing risk factors associated with the cause of road traffic accidents (Odero, 1997; Krug, 1999,). The main criticism is cantered to the arguments that; 1) the important components of the traffic system such as means of transport (vehicle), environment (roads) and human behaviour were not directly involved/covered; 2) It is more focused on prevention assuming that the causes are already known.

William Haddon (1980) developed a matrix that identifies risk factors before the crash, during the crash and after the crash, in relation to the person, vehicle and environment. Haddon described road transport as an ill-designed "man machine" system in need of comprehensive systemic treatment. Each phase: pre-crash, crash and post-crash can be analysed systematically for human, vehicle, road and environmental factors.

Table 3.2 Haddon safety measure matrix

	Before crash	In crash	After crash
Driver (road user)	Training, education (e.g. avoidance of drink-driving) attitudes, conspicuous crossing (Pedestrians, cyclists)	In-vehicle restraints fitted and worn	Emergency medical services
Vehicle	Primary safety (e.g. Braking, roadworthiness, visibility) speed, exposure.	Secondary safety (e.g. impact protection)	Salvage
Road	Delineation, road geometry, surface condition, visibility	Road side safety (e.g. no hazardous poles	Restoration of road and traffic devices

Source; *Commission for Global Road Safety (2008).*

Haddon's work relied on examples from public health efforts to address phases in the crash and injury process (pre-crash, crash, and post-crash) to define the rows of his matrix. Initially, in creating the matrix, Haddon crossed these concepts (the rows) with columns depicting such factors as driver, passengers, pedestrians, bicyclists, motorcyclists, vehicles, highways, and police.

Later, Haddon refined the model to its current form, listing the columns as follows: human (or host); vehicles and equipment (vehicles for transmitting the agent); physical environment; and socioeconomic environment. Still later, he revised the model to consider topics other than traffic crashes, changing the labelling of the rows to "pre-event," "event," and "post-event".

Table 3.3 Haddons' Matrix for Motor vehicle collision

Phase	Host (person affected)	Factor		
		Agent or vehicle	Physical environment	Social environment
Pre-event (→ primary prevention)	Driving skill, Time pressures (in a rush to get home?) Inebriated?	Car design & handling; Anti-lock brakes, etc.; Maintenance of car	Road design; Speed limits	Reliance on private, rather than public transportation raises traffic load; Compliance with seatbelt laws
During the event (→ secondary prevention)	Wearing seatbelt?	Air bags working? Size of car & crash resistance	Weather conditions; ice on road?	Quality of emergency assistance; Assistance from bystanders
Post-event (→ tertiary prevention)	Ability to call for help (phone available?); Knows first aid?	Tendency of car to catch on fire	Emergency vehicle access to collision site	Continued funding for emergency services

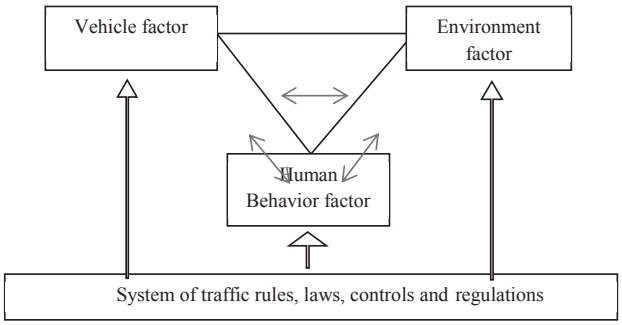
Source; *Commission for Global Road Safety (2008).*

In the columns, Haddon identified the host (or person affected by the injury). The agent, which he defined in terms of energy transferred to the host by either an inanimate vehicle or an animate vector. Moreover, the environment consisting of those elements of the physical surroundings that contribute to the occurrence of potentially injury-producing events or to injury (e.g., the physical characteristics of the roadway, building, playground, athletic field, or factory). In addition, the social environment refers to the socio-political milieu affecting the process, which could include cultural norms, political environments (e.g. willingness to adopt regulatory interventions etc.), and the legal environment (e.g., the presence or absence of seat belt usage laws; practices regarding enforcing drunk driving laws or prosecuting perpetrators of domestic violence or child abuse) (Haddon, 1980).

The strength of the Haddon matrix is that it could be applied in multidisciplinary domains and in several contexts. It is broadly comprehensive in such that it attempts to explain the causal factors responsible for traffic injuries, and also provides directions as to what should be done to prevent the injuries and it serves as a guide to manage them if they do occur. The main critique to Haddon matrix is that, it lacks a clear direction of association between main components of traffic system and their defined roles to the traffic system.

In 1999, Jørgensen and Abane made a heuristic adjustment of the ecological model of a disease to suit road traffic accident analysis. The model was named: A Model for Traffic Accident. The model for traffic accident is a framework for understanding the multiple causes and prevention of traffic accidents that occur in developing cities (Jørgensen & Abane, 1999). This model is part of the system approach to the study of road traffic accidents. The components (subsystems) of the traffic system are the environment (roads), the means of transport (vehicles) and the behaviour of man. Integrated in the systems is a system of highway codes and enforcement mechanisms designed to ensure that road users adhere to the controls and regulations of traffic flow for maintaining road traffic safety (Jørgensen and Abane, 1999). This model has path lines with arrowheads indicating the direction of their influence and the nature of the relationship among the constructs (components).

Figure 3.2. A Model for Traffic Accidents Source: Jørgensen and Abane (1999)



Jørgensen and Abane`s model is based in "multi-causal chance phenomena approach". ***The environment subsystem***, comprising the road system and the wider physical and built up environment. The physical environment splits further into different aspects such as: Daylight and climate (weather conditions and road conditions), Spatial conditions (arrangements and macro structures), Settlement pattern (Urban or rural / sparse or populated area), situation of areas of residence and working areas, Principle of traffic separation, topography and road constructions qualities. ***The means of transport (vehicle) subsystem*** comprises of the volume and quality of vehicles on the modes of transport, it describes vehicles into its composition, age, technical conditions (such as lighting system, break system, tires, etc.) and safety equipment like seat belts in a car. In addition, ***the behaviour of man subsystem*** comprises of demographic characteristic of road users (age, sex, education, socio-economic status, stage in life cycle), people's perceptions of risk and people's general behaviour on the streets. And it goes further into driving behaviour, driving experience, driving style, risk compensation and risk driving (influence of alcohol and drugs) (Jørgensen & Abane, 1999).

In a specific way, the subsystems (vehicle factor, environment factor and human behaviour factor) in the model for traffic accidents are linked and integrated with reinforcement mechanisms to ensure controls and regulations of traffic flow. This link-up to the subsystems of the system facilitate quality condition of the system, efficiency of the system, and facilitation of safe operation of the subsystems in the system. Like what Leplat (1984) and Skyttner (2005) pointed that, lack

of link-up between the element of a system can lead to inefficiency and also can deteriorate the safety conditions of the elements, hence improper organisation of the system or malfunctioning of the subsystems. The main critique to Jørgensen and Abane`s model (1999) is that, the model is considered as stationary model.

Currently, the term safe system seems to represents the current consensus of what constitute best practice strategic thinking in road safety (OECD, 2008; Salmon et al. 2012). It builds upon Swedish evolution of road safety strategies (Vision Zero) and Dutch principles of sustainable road safety. The vision seeks to prevent crashes, or at least, to reduce crash severity to a point where (severe) injury risk is eliminated (Tingvall & Haworth, 1999). Humans are fallible operators and mistakes must be anticipated as inevitable in the transport system. However, latent errors in traffic system must be reduced. All elements in the traffic system are inter related and responsibility for safety must be shared across all actors (Salmon et al. 2012).

This historic perspective is important in understanding the social context in which attempts to advance strategic countermeasures have had to struggle with wide spread, accepted views that, if poor behaviour is the principle cause of accidents, then countermeasures within the traffic system towards behaviour change is an answer (OECD, 2008). The safe system suggests not only designs that seek to eliminate deliberate misbehaviour but also human error-tolerance (Tingvall & Haworth, 1999). The individual road user is expected to comply with prescribed behaviour, to be well trained and licensed, to be fit to take part in traffic and comply with operational traffic rules (Koonstra et al. 2002)

3.2 System approach

The application of system approach in this study is framed by heuristic meso-model modified from a Swedish model of safe road traffic designed for car occupants to suit all road users. The modified model (refer fig. 3.3) constitutes three components of the traffic system: Safe vehicle, safe road environment and safe road user behavior. Integrated in the system is the engineering design, reinforcement mechanism and safe speed as a cohesion loop for linking, coordinating, controlling, giving feedback and facilitating the components to safe traffic system as an overall goal.

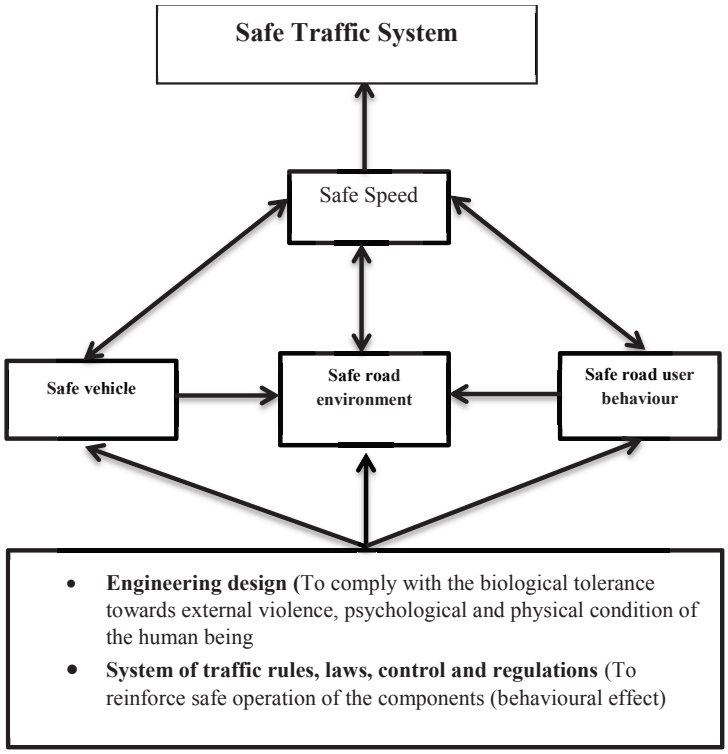


Figure 3.3 Heuristic model for safe traffic system

Source: Modified heuristic model from the Swedish Road Administration, 2008.

A model for safe traffic system presents a set of interacting units (safe vehicle, safe road environment, safe road user behaviour together with control mechanism) that form an integrated whole (group cohesion) designed for understanding the mechanism of safe traffic system. This is a complex socio- technical system that consist multiple parts, which depended on each other to perform a common goal. To ensure control of the performance variability of the components of the system, a model treats components as hierarchical structures and recognises accident as a control problem. Safety in this case is considered as an emergent property and such property can be controlled by a set of constraints related to engineering design and reinforcement mechanism. According to Leveson (2002), accidents occur when the components interact and those interactions violate the constraints. In addition, such violations are not handled properly by system control.

It is important to understand that, traffic system is not static; it continually experiences change as adaptations are made (man environment adjustment and maladjustment) in response to accident problems to better suit safety goals. Thus, there could be unexpected interactions between the components of the system that are not obvious and anticipated. According to Hollnagel (2004), the performance in any components of the system is necessarily variable. This is due to both the performance variability of the components of the system and to the complexity of their interactions. Under this condition, components of the system are defined based on their roles and expected objectives of the system in order to control unexpected interactions.

A prerequisite base for the system components as a control mechanism is the engineering design and reinforcement mechanism. Engineering design serves as the basis for designing roads and vehicles that are optimally adapted to human limitations, their possibility of making errors and the consequence of their erroneous action. System of traffic laws, controls and regulation serves as the basis for regulating and facilitating safe operation of the components constituting the system.

Safe vehicle component in the model refers to a condition and design of the vehicle operating on the traffic system; 1) it must support a correct use, 2) equipped with safety devices to protect drivers and passengers, 3) designed to protect other road users. In addition, safe vehicle component is subject to enforcement mechanisms, the system of traffic laws, controls and regulations. In this context, safe vehicle component is regarded as qualified registered vehicles based on the state rules, regulation, policy and controls which govern the automobile operation in terms of safety quality, their composition, age, technical conditions such as lighting system, break system, tires, and other safety equipment.

Safe road environment refers to the total set up standards of the road system and the wider physical and built up environment in a place, as well as how weather condition are adapted by the traffic systems in relation to speed, rules and maintenance. It also depends on how spatial conditions (arrangements and macro structures) are set up with streets, road signs, round-about, settlement pattern (Urban or rural / sparse or populated area), standard situation of areas of residence and working areas, principle of traffic separation, topography and road constructions qualities (engineering). All these elements should support a correct use of traffic system and must be forgiving in an injury mitigation perspective.

Safe road user behaviour refers to how road users are prepared/trained, internalised with safety knowledge or safety culture to interact in the traffic system with different roles such as a driver, or as a pedestrian or as a passenger. A safe road user is expected to be well internalised with traffic risk awareness, attentive to traffic risk, equipped with safety knowledge, capability, capacity and willingness to correctly use traffic system. In addition, other social demographic characteristics of road users such as age, sex, education, socio-economic status, are also considered relevant and important dimensions in understanding road user behaviour. Driving behaviour is socially constructed and could be gendered; driving experience is determined by age, driving style is determined by personality traits etc.

The three components of the traffic system (road environment, vehicle, and human behaviour) are linked to work as a group cohesion (Amalberti, 2001; Skyttner, 2005; Paries, 2006). More specific, a cohesion loop of the components will lose its synergetic properties and cannot be understood if analytic reductionist approach is used to examine it (Skyttner, 2005). The traditional, reductionist approach (focusing on one component of the system) to the study of road safety or traffic accidents proclaimed several limitations (Emmerik, 2001). System approach is considered a promising way to overcome such limitations by considering its subsystems (components) as whole and not separate parts (Leveson, 2002; Skyttner, 2005; Paries, 2006). System approach drives from the relationships between the parts of systems; how the parts interact and fit together (Zein & Navin, 2003).

By treating all the three components of the traffic system as a whole. The passive safety or injury mitigation capability of the traffic system in the model is determined by factors relating to engineering effect and factors relating to behavioural effect. Engineering effect refers to the intended effects of road safety measure on a set of risk factors related to accident occurrence or injury severity (Elvik, 2005). Behavioural effect refers to road user behavioural adaptation to road safety measures. The behavioural effect is related to engineering effect in the sense that certain properties of the engineering effect of road safety measure influence the likelihood that behavioural adaptation will occur (Elvik, 2005).

By recognising that, traffic system is an operating system, which involve movement as a determinant factor, the stability of safe operation of the traffic system is determined by speed as a

given factor. According to Tingvall and Haworth (1999), speed determines the total injury mitigation of the traffic system. If a higher speed is desired, the safety performance of the vehicles, roads/street and/or road users must be increased. Deficiencies in the system design and reinforcement mechanism must be compensated by lower speed. A higher speed normally increases the likelihood of an accident. The general relationship between speed and accident risk varies with initial speed level and road type (Tingvall & Haworth, 1999). In addition, drivers driving much faster than the average driver have a higher accident risk in the system

Safe system approach suggest identification of human risk factors that may influence safety measures by way of two causal chains, 1) the reliability of engineering effect at a given means of transport (vehicles) and road environment, and 2) behavioural adjustment (behavioural effect) to engineering principle. Reliability in engineering is defined as the probability that a component satisfies its specific behavioural requirements over time and under given conditions (Leveson, 2002). Behavioural adjustment to engineering principles is a coping strategy (risk perception, risk attitude, risk willingness, beliefs, and risk taking behavior) to appropriate interaction of the system components. For instance, if a driver applies the brakes too late to avoid hitting the car in front, we would not say that the brakes failed because they did not stop the car under circumstances for which they were not designed. The brakes in this case were not unreliable, they operated reliably, but the requirement for behavioural adjustment (such as driver being attentive, awareness of the breaking distance in relation to speed etc.) exceeded the capabilities of the brake design. Safety is an emergent property and in this case (based on system thinking), safety is viewed as a control problem rather than a failure or reliability problem. Solution is to suggest measures underlying a feedback control loop that should act to ensure that the safety constraints are enforced or controlled.

In addition, rather than dealing with only direct factors constituting the traffic system. It is important to consider that chains of directly and indirectly related failure events cause accidents. This assumption implies that, identifying directly related predecessor events will not identify the root cause. Most accident analysis techniques identify the proximate chain of event and often the conditions underlying those events. Almost none include systemic factors i.e. reductionist, because those factors only have an indirect relationship to the events and conditions (Leveson, 2002).

3.2.1 The application of system approach in Tanzania (context of low-income country)

The application of system approach to the study of traffic accident in Tanzania is different compared to how could be applied in developed countries. There is a big difference between traffic system in high-income countries and traffic in low-income countries (WHO, 2013). The traffic pattern in low-income countries are more complex than those in high-income countries (Mohan, 2002). According to Mohan, the reasons for greater complexity in less motorised country urban areas are 1) Large proportion of low-income people living in shanty towns, 2) a high proportional of non-motorised and two wheeler trips, 3) the presence of locally designed para-transit vehicles, 4) high density living and mixed land use and 5) severe limitations of land use. As a result, it is assumed that not all road safety strategies used in developed countries can directly be applied in developing countries (Mohan, 2002; Mutto et al. 2002; Onabolu et al. 2008; WHO, 2009; Jacobs and Aeron-Thomas, 2000). One of the main argument is that, the composition of traffic and accident patterns in modern less-motorised countries are not only different from those prevailing today in the high income countries, but they are also substantially different from those prevailing in the high income countries at a comparable stage of development in the past (Mohan, 2002). Traffic system in low-income countries is an open system where no proper control and organisation compared to developed countries (based on differences in culture, level of economy, technology and political stability).

Therefore, traffic system in Tanzania is viewed as a large complex organisation and the management level of the system is the parliament or the government (Political entities), which are responsible for the very preliminary strategies, policies, legislation and infrastructure. This implies that the problem of road traffic accidents in Tanzania is not at a causation level, it is rather at a societal level. Hence, more focus on institutional set up, infrastructures, policies, community participation, strategies to sensitise politicians, or influencing political agenda, culture and professionalism, as well as exploring collective behavioural traits for specific road safety interventions

To suit Tanzanian context, a model of road safety by Swedish Road Administration (2008) is modified by integrating enforcement mechanism derived from Jørgensen and Abane`s model for road traffic accidents. This specifically intended to provide a strong base in understanding the system of traffic rules, laws, control and regulations exhibiting developing cities. In addition, it

provides a basis for understanding the wider social cultural environment in relation to risk taking behaviour associated with traffic accidents and the operation of traffic system at a given place.

Even though Hollnagel (2004) argues that, performance variability of the components of the system are always normal. To suit Tanzanian context, the performance variability of the system components is divided into two types; 1) violations and 2) errors. Intentional violations (e.g. over speeding, non-use of seat belt or driving under influence of alcohol) are not treated as normal or as errors. They are identified (qualified and quantified) as contributing factors within a chain of causation factors (the causes of the cause). Strategy is to be lowered and not being accommodated. While, vulnerability due to age, disability and capability related violations are considered errors to be accommodated. To some extent this is contrary to the promoters of Road User Approach (Sabey & Taylor, 1980; Wegman, 2002) in which they are more prone to see errors as violations. In line with promoters of Vision zero (Tingvall & Haworth, 1999), a clear distinction of the variability is necessary. Variability through violations must be identified as a dimension for strategic road safety interventions, safety policy, traffic rules and must be lowered. Errors can or must be allowed or tolerated if the designers of the system deal with them.

3.3 Risk theory and Cultural approach

3.3.1 An overview practice of risk theory in studying road traffic accidents.

Traditionally, the application of risk theory to the study of road traffic accidents and road safety has been more into the field of Traffic psychology (also known as mobility psychology). Traffic psychology is the study of the behaviour of road users and the psychological processes underlying such behaviour as well as the relation between behaviour and accidents (Moen, 2008).

Wilde (1982) proposed the risk homeostasis theory (RHT). The purpose of the theory is to provide a rational basis for the formulation of strategies for research and safety measure development in the field of road safety. He postulated that drivers have a target level of risk that act as the reference variable in a homeostasis process. In a homeostasis process the reference variable fluctuates about its mean value much like the body temperature of a healthy person remains nearly constant – increasing and decreasing only slightly from its mean value. This risk theory predicts that any technical change in the transport infrastructure will not reduce accidents as long as the target level risk remains the same. It requires that the road users be motivated to change their target risk level

in order to improve road safety. This theory has inspired considerable discussions for the last two decades. Some of the discussants, notably Adams (1995), discount the work done in the name of road safety. Analysis of USA accident data did not support the theory (Evans, 1991). The main difficult of this theory is that it is difficult to prove experimentally (Trimpop 1996) and some see its formulation as incoherent (Haight 1986). Review of the RHT by Trimpop (1996) concur that the strict notion of risk homeostasis is still open to debate, as the theoretical and empirical difficulties of this theory have not been resolved.

Risk compensation is another risk theory. According to Thomson et al (2002), an individual provided with a protective device such as an automobile seatbelt will act or behave in a riskier manner because of the increased sense of protection from the seatbelt and thereby nullify the protection afforded by the seatbelt. Risk compensation theory (RCT) describes commonly observed phenomena in traffic, like traffic slowing down during heavy downpours to compensate for the increased risk and faster traffic on a road with higher design standard. Its plausibility, at least at the common sense level, has probably contributed to its wide acceptability among safety practitioners compared to the RHT (Trimpop, 1996). Although it is referred to as "theory or hypothesis". Trimpop (1996) noted that neither mechanisms involved nor the terms it uses are clearly described or defined in the literature. Haight (1986) states that, it is impossible to say how much risk compensation there is since risk is not the only factor affecting the driving style. Similarly, the degree and type of compensation varies from individual to individual and across time and space as well as differing situations. Thus even though risk compensation does exist, it is unreasonable to suppose that effort to improve road safety are entirely consumed by risk compensation.

Behavioural adaptation is the most frequently used approach in conjunction with road accident research (Evans, 1991). In the domain of road traffic, behavioural adaptation approach is more focused on road user's actions that are contrary to intended road safety measures in a place. Behavioural adaptation approach to some extent refers to specific aspect of risk compensation in traffic. It uses the term compensation to describe unintended change in behaviour that may occur as a result of implementing changes in the traffic system. Grayson (1996) described compensation elements in behavioural adaptation approach have already been included in the theory of risk compensation and may result in confusion. He also noted that it focuses on the negative aspects.

However, it is worthwhile noting that, the use of the term risk compensation may be instrumental in encouraging road safety professionals to consider possible behavioural adaptation that planned changes in the system may induce.

Risk perception and the relation between risk judgments and decision under uncertainty is another approach of risk theory. Nordfjærn, Jørgensen, Iversen, Oltedal and Rundmo (2011) tested the approach, when they researched about "The role of risk perception and other related judgements in transportation mode use" In their study, subjective risk judgements were used as a cumulative term, which included several concepts with potential relevance to risk decisions and risk taking behavior. Thus, the risk constructs that constituted subjective risk judgements were found to be relevant both to transport risk decision and more specifically to risk decision related to road traffic safety. Subjective risk judgements included the following risk constructs; road traffic risk perception, risk sensitivity, risk willingness, risk tolerance, degree of worry, risk attitudes and risk taking behavior. The development of this approach is one of the responses to critiques arose from previous risk theories. Indeed, Wilde (1982), Evans (1991) and Trimpop (1996) indicate that, a possible means to attain comprehensive evaluation of risk taking behavior associated with road traffic accidents is to associate more than one theoretical approaches or related concepts. Wilde (2002) in his study, "*Does risk homeostasis theory have implication for road safety*" he concluded that, complex studies such as road safety which involve more than one disciplines demands multi-concept approach relevant to guide a particular study objective.

In this study, risk theory is applied based on the concepts of risk perception, risk attitude, risk willingness, degree of worry and the relation between geographical areas and risk-taking behavior. In the coming sections, risk theory in geographical parameters and how risk theory is applied in this study is presented.

3.3.2 Risk theory in geographical perspectives.

Immediacy and scale dependency is an important distinction between psychological and geographical parameters in applying risk theory to the study of road traffic accidents. Immediacy is a philosophical concept related to spatial and temporal perspectives that suggest geographical perspective in a scale. Considerations of immediacy reflects both physical and social cultural

environments embedded in a place or a phenomenon of concerned. Whereas, spatial scale is about describing, stratifying, classifying or making a set of large approximation to the extent or size of more accurate concept of order. Among geographic objectives, geographers have tended to use risk theory with respect to a number of distinguishing parameters in assessing perception of risk and risk taking behaviour in space versus spatial behaviour. Golledge & Stimson (1997) identified these parameters in relation to; new models of behaviour, new models of environment, micro level focus, macro level focus and the basis for generalisation. These are geographical perspectives specifically designed to uncover and interpret spatial differences in risk perception, risk attitude, risk willingness and risk taking behaviour embedded in a place.

The new model of behaviour approach incorporate psychological factors, plus the effects of interpersonal influences, social interactions and constrains, motivation for group membership and decision making logic in relation to spatial behaviour. Risk perception and risk taking behaviour in this context are considered rational and influenced by objective external factors that are perfectly known, generated and appear to be spatially irrational. In this approach, attention is generally focused on individual's perception of risk based on the form and process that make it rational to risk taking behaviour in a particular geographical area. Eiksund (2009) tested the approach in his study "A geographical perspective on driving attitude and behaviour among young adults in urban and rural Norway" Eiksund revealed that; a spatial difference in risk attitude and risk taking behaviour, could be detected by factors constituting system risk and risk culture in a place. According to Eiksund (2009), system risk refers to existing objective factors in a place in which human behaviour is adjusted to adhere to such environment. For instance settlement pattern, differences in road structure, weather condition and vehicle population. While risk culture refers to human factors in a place; such as norms, values, attitudes, rules, politics, regulations and perception of road accident risk. In addition, when Golledge & Stimson, (1997) tested the approach, they noticed that; immediacy and scale parameters within interpersonal influences in a spatial context can be accounted by focusing more on studying small communities or neighbourhoods, rather than studying large areas. This approach suggest two important things; 1. Immediacy in risk perception relates to system risk and risk culture and 2. Focusing on studying small communities or neighbourhoods is an important spatial scale in a geographical study.

The revised model of environment claims that there are existed environments other than the observable external environment that influence behaviour of people in a place. Hidden dimensions of economic, political, cultural, social, moral, beliefs and other environments in a particular place have a significant influence in risk taking behaviour. Nordfjærn, Jørgensen and Rundmo (2011) tested the approach, when they compared cultural dimensions and social demographic predictors of car accident involvement in Norway, Ghana, Tanzania and Uganda. In their study, the questionnaire consisted of "culture as a symbol of exchange", destiny orientation such as tendencies to attribute accidents to factors such as bad luck, religion/destiny and demographic characteristics such as gender and age group. The results showed that, countries in Sub Saharan Africa with lower economy, scored higher on dimensions of culture as symbol of exchange and destiny. Demographic characteristics were also relevant for road accidents in the African countries. Even though most of the psychological studies indicates scant empirical support for the cultural effect in risk taking behaviour (i.e. Oltedal & Rundmo, 2006). Ward (2007) described that, people in rural areas tend to be socially more informal and traditionalistic than people in urban areas. Similar to demographic characteristics, older people may be more likely to live in rural areas and younger people in urban areas. Likewise, people with high education could be more likely to live in urban centres, whereas people in rural locations may more often have low education. An implication is that, an adjustment to geographical areas such as urban, semi-urban and rural parameters as well as demographic parameters is also important in determining behaviour. This approach suggest that; 1. Economic level of a place, political affairs, cultural aspects, social aspects, moral and beliefs related aspects have a significant influence in risk perception and risk taking behaviour. On the other side, 2. Demographic parameters are also important factors in determining road user's behaviour.

The micro level focus is another geographical approach about human behaviour in a reduced spatial and temporal scale (Golledge & Stimson, 1997). According to Golledge and Stimson, geographers pursued this behavioural approach in their attempts to obtain more satisfactory levels of understanding and explanation for the search of improved generalisation of behaviour in a place. Such generalisation is tied to aggregates based on ideological or societal dimension of behaviour other than on arbitrary criteria such as location, demography, or socio-economic indices of uniformity. In this approach geographers use stratified analysis to simplify the understanding of primary association of interest at different levels of potential confounding factors. Stratification is

a geographical approach of simplifying reality so that the relationship between complex variables may be more clearly studied (Flowerdew & Martin, 2005). Whereas a hypothesis might suggest a general relationship of chosen confounding factors, stratification facilitate to a more detailed pattern and specific tendencies to generalize behaviour of a place (Golledge & Stimson, 1997). Correlation of the key factors such as urban rural context vs demographic composition of such areas is one of the examples of stratified parameter in assessing behaviour in space in relation to spatial behaviour. This approach generally suggest the use of stratification methodology to simplify the understanding of primary association of interest at different levels of potential confounding factors.

The macro level focus approach retain the emphasis on decision making process, and choice behaviour of groups or leaders rather than the mass of ordinary people in a place (Golledge & Stimson, 1997).. Thus, in this approach, decision-making process is developed to comprehend power relations at various scales and the power structure that defines decision paths. This geographical approach is more focused on goal-directed behaviours in space versus spatial behaviour. The focus is power relation in decision-making, social hierarchy, and authoritative factors that constitute a significant influence in changing behaviour of a group. To some extent, the macro level focus refers to the object of potential effect of power. In social sense, the object of potential effect of power can determine or reflect behaviour of others in a place. Government authorities, traffic rules, regulations, controls, police enforcement, effectiveness of government, road safety agency, and other related road agency have a significant potential effect in controlling and changing behaviour of road users. This approach is specifically relating to some elements of political ecology approach about power relations. Theoretically this approach suggest consideration of levels of decision making as an important scale in determining behaviour of road users in relation to social organization of a place or politics in a place.

The basis for generalization is another geographical approach that incorporates new models of behaviour, new models of environment, micro level focus and macro level focus in attempt to find sets of human action in a place based on composition conditions and to contextual conditions embedded in a place. Stratification or stratified analysis makes legitimate, realistic and appropriate statements that can define or interpret individual's behaviour in a place.

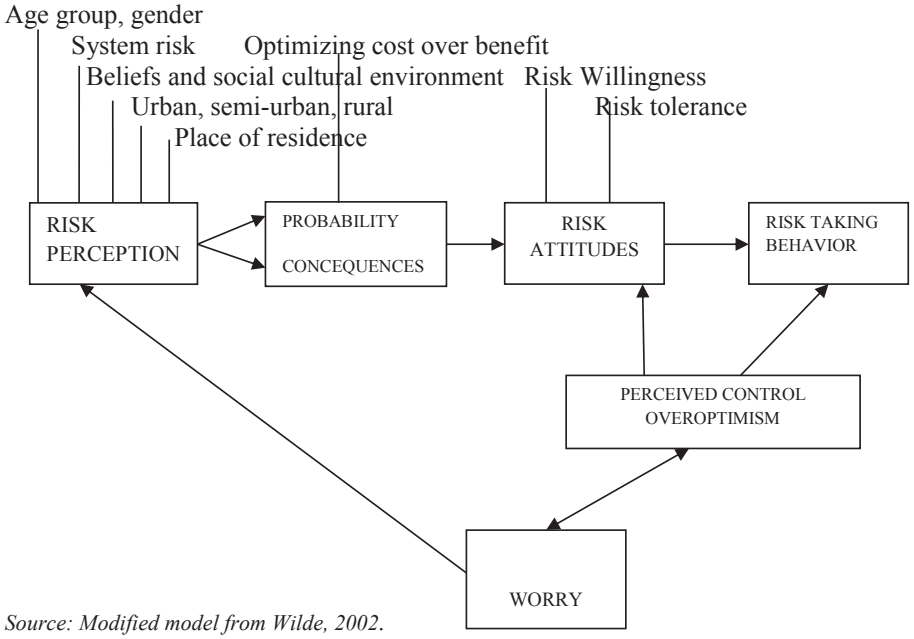
3.3.3 Application of risk theory in this study.

A risk model, modified from Wilde (2002), frames the application of risk theory in this study. The modified risk model (refer fig. 3.4) presents relevant construct (partly psychological and more in geographical parameters) of risk taking behaviour. A prerequisite factor is risk perception. Differences in individual's risk perception about risk source from road traffic accidents is conceptualised to be influenced by age, sex, ethnicity, belief, place of residence (urban, semi-urban or rural) or education. Risk perception servers to understand how road users convert information about risk source from road traffic accidents and it serves to uncover their probabilities of engaging into risk taking behaviours. Risk perception also provide prerequisite characteristics that conceptualise reality about expected risk taking behaviour in space. The characteristics range from age-group interval, gender difference, faith based groups, geographical area such as urban-rural environment to other relevant demographic units. Risk perception provides clues to individual needs and values. When individual differences are manifested in risk taking behaviour and are not assignable to structural causes, then perception can indicate to what extent the differences are assignable to cultural values and to the nature of social interaction in a place. Social cultural values such as religious values may accrue and interfere either positively or negatively to spaces of risk taking behaviour. It is therefore important to understand hidden elements embedded within social groups, social settings, and group grid values in order to determining perceptual threshold in relation to environmental stimuli.

Risk attitude is an intermediate factor between risk perception and risk taking behaviour (Slovic, 2006). The concept of risk attitude selves as a base of knowledge in determining possible internal traits of road users (i.e. their cognition, their emotion and their motivation) that may provide relevant dimensions for improving risk-taking behaviour in a place. Even though the concept of risk attitude and the nature of attitude formation have received relatively little attention by geographers in relation to human spatial behaviour (Golledge & Stimson, 1997). A psychological approach indicates that, attitude traits are strong predictors of behaviour (Ajzen, 2001). Many geographical references including Golledge & Stimson (1997), admits that attitude formation is an important causal factor in analysing locational decision-making as well as man environment adjustment and maladjustment. In this study, the concept of risk attitude provides bases for understanding individuals' perceptual composition in relation to their degrees of risk willingness and risk tolerance behaviour. This includes the assessment of feelings and emotions internalised

by desires and social cultural values (such as religious beliefs) that are embodied in environmental images. On the other hand, the degree of worry can directly influence risk perception and indirectly influence risk attitude and risk taking behaviour.

Figure 3.4 Risk Model



Source: Modified model from Wilde, 2002.

In general, the use of risk theory in this study is focused more on the conceptual approaches defining risk perception, risk attitude, risk willingness, and degree of worry as important factors in determining risk-taking behaviour associated with road traffic accidents. The modified risk model stands as a framework indicating connection, direction and association of factors in terms of form and process.

3.3.4 Conceptualisation of factors

Risk perception

The study of risk perception arose out of the observation that experts and lay people often disagreed about how risky various technologies and natural hazards were (Bodenhausen, 1993). Risk perception is defined as the subjective judgment that people make about the characteristics and severity of a risk (Slovic et al., 1982; Slovic, 2006; Moen, 2008). The phrase is most commonly used in reference to natural hazards and threats to the environment or health, such as road traffic accidents.

Several theories have been proposed to define risk perception and why different people make different estimates of the dangerousness of risks. Three major families of theories have been developed: psychology approaches (heuristics and cognitive), anthropology/sociology approaches (cultural theory) and interdisciplinary approaches (social amplification of risk framework) (Helgeson et al, 2012).

Researches based on Cognitive Psychology, argue that, majority of people in the general public express a greater concern (high perception) for the problems which appear to possess an immediate effect on everyday life such as, hazardous waste or pesticide-use than for the long-term problems that may affect future generations (low perception of it) such as climate change or population growth. ((Gregory & Mendelsohn, 1993; Van der Linden, 2015). People do not perceive the risk of environmentally destructive behaviours even when experts provide detailed and clear risks caused by climate change because it has no immediate effect (Moen, 2008).

Gregory & Mendelsohn (1993) argued that, risk perceptions are influenced by the emotional state of the perceiver. Positive emotions (such as happiness) lead to optimistic risk perceptions while negative emotions (such as fear and anger) influence a more pessimistic view of risk. Therefore, risk and benefit tend to be positively correlated across hazardous activities in the world, and they are negatively correlated in people's minds and judgements (Moen, 2008).

The anthropology/sociology approach posits risk perceptions as produced by and supporting social institutions (Thompson et al., 1990). In this view, institutions, cultural values, and ways of life socially construct perceptions. Douglas (1985) outlined four “ways of life” in a grid/group arrangement. Each way of life corresponds to a specific social structure and a particular perception on risk. The tighter binding of social constraints limits individual perception and negotiation.

Chauncey Starr (1969), cited in Koger & Deborah (2010), revealed preference approach to find out what kind risks are perceived acceptable by society. His major finding revealed that people would accept risks 1,000 greater if they are voluntary (e.g. driving a car), than if, they are involuntary (e.g. a nuclear disaster). In most cases, voluntary risks (such as driving a car) are always perceived low, tolerated and accepted in a society.

The Social Amplification of Risk Framework (SARF), combines research in psychology, sociology, anthropology, and communications theory (Moen, 2008). SARF attempts to explain individuals or institutions can amplify perception through communication chain, for either receiving public attention or attenuated, receiving less public attention (Kasperson & Kasperson, 2005 cited in Moen, 2008). The main thesis of SARF states that risk events interact with individual psychological, social and other cultural factors in ways that either increase or decrease public perceptions of risk (Nordfjærn et al., 2011).

Nordfjærn et al., (2011) argued that, one of the contributions to theoretical understanding of risk perception as a cognitive entity was articulated by social cognition theories such as. The theories argue that, risk perception is relevant for behavioural intensions and decision-making. The health belief model by Rosenstock (1974) is one of the social cognitive theory, which suggest that, protective behaviours are more likely to take place when individuals perceive themselves to be vulnerable of the risk source. In addition, cues to actions such as psychological distress, psychosocial problems, education, exposure, campaigns, demographic characteristics, culture, motivations and perceived control are considered moderators in the model (Rosenstock et al. 1994; Nordfjærn et al., 2011). An implication to the study of road traffic accidents is that, when people perceive themselves to be vulnerable of road traffic accidents at a place, they could also become more motivated to reduce the probability and consequences of such accidents by for instance influencing political agenda as well as a demand for risk mitigation by the public.

Another social cognitive theory was developed by Weinstein (1988). Weinstein proposed three-step process for precaution adaptation before a preventive behaviour; 1) Detection of the risk source. 2) Interpretation of the potential effect of the risk source upon humans. 3) Realisation of their vulnerability to the risk source. After these three steps, behavioural change or adjustment may occur because of perceived consequence of the hazard. In addition, the social learning theory

by Rotter (1954) cited also in Nordfjærn et al. (2011) suggests that, protective behaviours are partially determined by individual's estimates of the probability that a particular behaviour will lead to specific outcomes. It is rather associated with expectances of desirable outcomes by protective behaviour. According to Nordfjærn et al. (2011), the stronger the expectancy is of producing a desirable outcome the higher is the likelihood of a specific behaviour suitable to produce desirable outcome. The implication of this approach to the study of traffic accidents or road safety is that, people will engage into enforcement mechanisms (such as system of traffic rules, controls, safety policy and safety practices) when such enforcement mechanism is perceived to be more likely to produce favourable results of safety in the traffic system.

The other example of social cognitive theory is a psychometric paradigm by Fischhoff et al. (1978). According to Fischhoff et al. (1978), risk perception is hypothesised by nine properties as a cognitive entity; 1) Voluntariness of risk, 2) immediacy of effect, 3) knowledge about the risk source, 4) knowledge to science, 5) control, 6) newness, 7) chronic and catastrophic potentials, 8) common and dread potentials, and 9) severity of consequences. Most researchers from psychology including Slovik et al. (1982) found that dread risk and unknown risk explained about 80% of variance in risk perception (Nordfjærn et al., 2011). This implicate that, people may perceive more risk by hazards or risk source which have uncontrollable and catastrophic potentials as well as hazards where they lack information (Nordfjærn et al., (ibid). Even though Gustavson, (1998) termed the psychometric paradigms as more focused on differences in the characteristics of hazard source than focusing on differences of individuals who perceive risk. People may perceive more risk of relatively infrequent events such as floods than more common hazards such as road traffic accidents.

Risk attitude

Risk attitude refers to a person's inner traits/thought towards risk taking (Maio & Haddock, 2010). Attitude is defined as an individual expression of favour or disfavour towards a person, place, thing, activity, duty or event (Van Bavel, Xiao & Cunningham, 2012). Attitude can be formed from a person's past or present information, knowledge, experience or worldview (Eagly & Chaiken, 1993). An attitude can also be as a positive or negative evaluation of people, objects,

events, activities, or ideas. It could be concrete, abstract or just about anything in the environment. Still a debate is going on about precise definitions.

Despite a debate about the particular structure of attitudes, there is considerable evidence that attitudes are evaluations of an object that have cognitive, affective, and behavioural components (Maio & Haddock, 2010). According to Maio & Haddock (2010) 1) the cognitive component of attitudes refer to the beliefs, thoughts, and attributes that we would associate with an object, it could be negative or positive attributes people associate with an object. 2) The affective component refer to person's feelings or emotions linked to an attitude object, for instance, people may be afraid or scared of spiders because their affective response towards spiders is negative. 3) The behavioural component of attitudes refer to past behaviours or experiences regarding an attitude object. For instance, risky behaviour on traffic such as speed driving or unnecessary overtaking behaviour implicate negative attitude towards low speed driving regulations or implicate impatient behaviour of a person.

According to (Ajzen, 2005), learning can account for most of the attitudes individuals hold. Theories of classical conditioning, instrumental conditioning and social learning are mainly responsible for formation of attitude (Breckler & Wiggins, 1992; Haddock, 2004). Unlike personality, attitudes are expected to change as a function of experience (Nordfjærn et al., 2011). In addition, exposure to the attitude objects may have an effect on how a person forms his or her attitude (Forgas et al., 2010). People are more likely to have a positive attitude on attitude objects when they are exposed to it frequently than if they were not. More repeated exposure of the individual to a stimulus is a sufficient condition for the enhancement of his attitude toward it (Forgas et al., 2010). Hence, negative attitudes towards traffic rules are regarded as possible negative influence on safety priorities and should be accounted for (Moen, 2008).

Change of road user attitudes is often advocated as a necessary condition for improvement of road safety (Nordfjærn et al., 2010). The relation between road user attitudes and accident risk or risk taking behaviour is however, not well known in most road safety research (Rakauskas et al., 2007; Nordfjærn et al., 2010). Two of the more dominant theories concerning the relation between attitude and behaviour are the theory of reasoned behaviour (Ajzen & Fishbein, 1980) and the theory of planned behaviour (Ajzen, 2001). The theory of reasoned action states that, the likelihood

to engage in a specific behaviour is predicted by personal attitudes and norms regarding such behaviour, while the theory of planned behaviour extended the perspective by including perception of control as a predictor of the behavioural action. Both theories have been extensively tested in relation to traffic safety (e.g. Parker et al., 1992; Åberg, 1993; Iversen & Rundmo, 2004; Eiksund, 2009).

Risk attitudes exist at individual, group, corporate and national levels, and can be assessed and described with some degree of accuracy (Hillson & Murray-Webster, 2007). Attitude relates to the inner working of the human mind (Eagly & Chaiken, 1993), so an individual or group can make an attitudinal choice to lean towards a particular desired response, behaviour or outcome (Finucane et al., 2000). According to Hillson & Murray-Webster (2007), some attitudes may be deeply rooted, representing core values for the individual or group, but they nevertheless represent a choice. Attitudes differ from personal characteristics in that they are situational responses rather than natural preferences or traits, and chosen attitudes may therefore differ depending on a range of different influences such as gender-stereotype, location, age, culture, belief etc. (Weber et al., 2002; Harrison et al. 2005).

The attribute of attitudes is essential for understanding and managing hazardous behaviour (Levy, 2006). If attitudes were fixed inherent attributes of individuals, inborn and unchangeable, then it would never be possible to manage them (Rabin, 2000). The attitudes of individuals or groups would then not be possible to predict behaviour (Weber & Milliman, 1997). According to Rakauskas et al., (2007) and Diener & Richardson (2007), the attribute of individuals vary by different aspects exerting influence to individuals, these could be by geographical areas (urban, semi-urban or rural), or by demographic characteristics (such as age, sex, education).

Risk attitude refers to chosen response to perception of significant uncertainty (Haddock, 2004). A range of possible attitudes (willingness, tolerance etc.) can be adopted towards the same situation, and these result in differing behaviours, which lead to consequences, both intended and unintended (Hillson & Murray-Webster, 2007). Individual values and norms can influence either risk tolerance or facilitate the degree of individual willingness to take risk. Indeed behaviour is the

only reliable diagnostic indicator of inner attitude (Maio & Haddock, 2010; Nordfjærn et al., 2011).

Although attitude manifests itself through behaviour, there are other influential factors of behaviour, which can displace the chosen or preferred attitude (Steers & Porter, 1991; Gerd, 2002). When a situation or environment is perceived as positive, behaviour is driven largely by attitude (Hillson & Murray-Webster, 2007; Devos, 2008). In this case, the attitudinal choice of the individual or group is the key determinant of behaviour. When an individual or group perceives a situation or environment as negative, the resulting behaviour is largely determined by a direct response to the situation, and attitude plays a smaller role (Devos, 2008). For example in a setting where one's personal safety is threatened, the response is adopted almost unthinkingly, regardless of the prevailing attitude of the individual. Indeed a negative situation may force behaviour, which is contrary to that preferred by attitude, leading to a more reactive stance (Olson & Zanna, 1993; Nordfjærn et al., 2011).

Individuals who regularly adopt reactive behaviour driven by a perception that the environment is negative may be termed pessimists (Greenwald, & Banaji, 1995). Although the responses to positive and negative situations suggest at first sight that environment or situation is the prime determinant of behaviour, in fact this raises the question of what influences behaviour when the situation is uncertain (Gerd, 2002). In this case, the important driver of behaviour is whether uncertainty is perceived as favourable or unfavourable.

One key conclusion on which researchers and practitioners are agreed is that risk attitudes exist on a spectrum (Ajzen, 2001; Fazio & Olson, 2003). The same uncertain situation will elicit different preferred attitudes from different individuals or groups, depending on how they perceive the uncertainty (Hillson & Murray-Webster, 2007). In addition, since attitude influences behaviour, different people will exhibit different responses to the same situation, as a result of their differing underlying risk attitudes (Ajzen & Fishbein, 1980; Olson & Zanna, 1993)

Risk willingness

Risk willingness refers to individuals consent to engage into actions that have the potential to be harmful or dangerous, at the same time provide the opportunity for some kind of outcome that can be perceived as positive (Ale, 2009). What is perceived to be an important goal to attain is considered as an important stimulus of individuals to create consent to take risk (Rosa, 2003: Henriksen & Uhlenfeldt, 2006).

The level of risk that an individual is willing to accept represents a balance between the potential benefits of innovation and the threats that change inevitably brings (Beck, 1992). The appropriate level depends on the nature of risk source and the objectives pursued (Rosa, 2003). For example, modern people strive for private owned automobiles despite related risks such as accidents. The degree of willingness to purchase an automobile and, the resulting rejection of public transport, is a consequence of a rational comparison between the benefits and costs of several transport choices. The privately owned automobile affords user unrestrained spatial accessibility and timesaving in appropriating opportunities in a space economy. Unrestrained spatial accessibility and timesaving stand as a catalyst to stimulate people's willingness to take risk (Vaconellos, 2001; Button, 1993; Small& Gomez-Ibariez, 1998).

Precise measurement of an individual risk willingness is not always possible; it needs a thorough understanding of an individual's internalised values. Indeed, it is the cultural background of people, which plays an important role in the degree of worry for a certain risk (e.g. road traffic accidents) and the degree for risk taking and risk tolerance. Culture is regarded as the best predictor of people's worldviews (Trimpop and Wilde, 1994; Dauglas, 1985; Wildavsky and Dake, 1990). Based on their cultural worldviews, individuals organize their own perceptions and they chose what to fear and how much of it to fear. Therefore, the degree of an individual willingness to take risk is a function of either people's behavioural faults or simply destiny (Wildavsky and Dake, 1990).

Degree of worry

How people judge the risk of potential hazards, such as traffic accidents, may not sorely be influenced by cognitive interpretations about the probabilities and consequences of accidents (e.g. Risk perception) (Nordfjærn et al., 2011). Subjective risk judgement could also relate to emotions

such as worry (Moen & Rundmo, 2005). The degree of worry about traffic accidents can be refereed as the level of concern that people experience when they think about the risk of traffic accidents in a traffic system. Wilde (2002) associated worry with cognitive interpretations (perception) as well as perceived control over optimism to influence attitude and behaviour. Moen (2008) defined worry as negative mental images of undesirable negative event.

Zajonc (1980) argued that, the degree of worry (emotions) could be present before and after cognitive evaluations of risk in the causal chains. This implicate that worry could be a primary or a secondary reaction to cognitive processing of the characteristics of a potential hazard (Nordfjærn, et al 2011). In psychology, subjective risk judgment can be categorised into two parts 1) risk as analysis and 2) risk as a feeling. Slovic et al. (2004) identified the first category as a cognitive probability assessment, which is regarded as processes that require conscious control. Loewenstein et al. (2001) identified category two as an automatic, intuitive and unconscious processing of risk, which partially rely on mental images (worries) of hazards or risk source.

Studies indicates that, cognitive assessment of probabilities and the potential of severities predict worry (Rundmo, 2001). In addition, Rundmo (2002) asserted that, worry might derive from cognitions about risk source. Kobbeltved et al., (2005) perception of risk prospectively predicted worry. In psychology, the degree of worry is also associated with gender. Moen and Rundmo, (2006) found that, females emphasised worry more than males in regard of both the use of public and private means of transportation.

Cultural approach

In addition, risk culture approach holds that it is the cultural background of a people, which plays an important role in the understanding of traffic risk beliefs, degree of worry for road traffic accidents and the degree for risk taking and risk tolerance behaviour. Culture, defined as set of beliefs, symbols, value systems, attitudes and practices prevailing in a society is regarded as the best predictor of people's cultural worldviews (Trimpop and Wilde, 1994). Based on their cultural worldviews, individuals organize their own perceptions and they chose what to fear and how much of it to fear (Wildavsky and Dake, 1990). Cultural theory concludes that the predisposition to road traffic accidents in the lowly developed countries is a function of either people's attitudes,

behavioural faults or simply destiny. Mitigation measures must therefore target, people's behavioural faults (Wildavsky and Dake, 1990).

The cultural approach, aims at explaining how people perceive and act upon the world around them. It consists of a conceptual framework and an associated body of empirical studies that seek to explain societal conflict over risk. The argentic perspective is central to human organisation (social cultural environment) in understanding and interpreting different risk source within their physical environment. It is more specifically claims that, risk perception, risk attitudes, risk willingness and risk taking behaviour of people is largely determined by social aspect and cultural adherence of a place (Douglas, 1978; Thompson et al. 1990).

The cultural theory of risk generally asserts that, structures of social organization endow individuals with perceptions that reinforce those structures in competition against alternative ones (Wildasvsky & Dake, 1990). According to Wildasvsky and Dake (1990), two features are identified; first is a general account of the social function of individual perceptions of societal risk. Individuals, tend to associate societal harms with conduct that transgresses societal norms. This tendency plays an indispensable role in promoting certain social structures or styles of living, both by imbuing a society's members with aversions to subversive behaviour and by focusing resentment and blame on those who defy such institutions. The second feature is a particular account of the forms that competing structures of social organization assumed. Two dimensions "group" and "grid". A "high group" way of life exhibits a high degree of collective control, whereas a "low group" one exhibits a much lower one and a resulting emphasis on individual self-sufficiency. Conspicuous and durable forms of stratification in roles and authority characterize a "high grid" way of life, whereas a "low grid" one reflects a more egalitarian ordering.

The main challenge to the cultural theory of risk has been subject to a variety of criticisms. Include 1) multiple functions of cultural meanings, 2) differentiated and dynamic nature of culture, and 3) relationship to ecological and social political factors. His critiques focused more on explanatory power of the theory in relation to modernity and politics. In addition, findings of Wildasvsky & Dake (1990) have not been replicated.

3.4 Political ecology approach

Political ecology is the combination of ecology and political economy (Walker, 2006; Baer & Singer 2008; Blaikie, 2008). Mayer (1996) introduced the political ecology of a disease concept, which focuses on the relevance of political and economic factors at different geographical levels in the study of health and diseases (Dove & Carpenter, 2008; King, 2010); this is now extended to accident risk as part of health problem.

Mayer (1996) notes that although politics is not the direct concern of geography, it plays a very vital role in determining the way in which the government and the public view and utilize the recourses and opportunities available to them. This exposition is strongly linked to various actors in order to understand the contextual realities of recourses use decisions (Watts, 2000; Walker, 2005), and capacity of the national and local authorities (Sutton & Anderson, 2004; Peet et al., 2011) to put road safety strategies and countermeasures in place.

Politics is 1) who gets what, when, how, and sometimes why, in terms of distribution and allocation of resources, and decision-making process in a society (Nnoli, 1987). Furthermore it refers to 2) achieving and exercising positions of governance or organized control over a human community, particularly a state (Paulson et al. 2003). A variety of methods is employed in politics to make state systems operate. These include making laws, security, social welfare, education and culture, mobility and transportation, health, safety, economy, policies, regulations, enforcement and exercising force etc. In general, politics is exercised on a wide range of social levels, from clans and tribes of traditional societies, through modern local governments, companies and institutions up to sovereign states, to the international level. It is very often politics to be referred as power (King, 2010).

The operation of politics is also based on worldviews. A common terminology identifying such group-grid politics is referred as left–right politics (Gauchet, 1997; Bryant, 1998). According to Bryant (1998), this classification is comparatively recent. The right wing often values tradition and social stratification while the left wing often values reform and egalitarianism (Gauchet, 1997). The Left believes in attempting to eradicate social inequality, while the Right regards most social inequality as the result of ineradicable natural inequalities, resource endowment and sees attempts to enforce social equality as authoritarian (Gauchet, 1997).

In general, the focus of political ecology approach is central to power relations (Robbins, 2012). How authorities at various levels as well as the level of community involvement in decision making, resource allocation, budgeting, rules, regulations, policy making processes (Blaikie, 1985; Greenberg & Park, 1994; Bryant, 1998; Paulson et al. 2003) are operating for shaping health prioritising (such as diseases and injuries) in place (King, 2010).

Thus, the content of political ecology emphasizes that human-environment relationship at local, regional, and global scales can be understood by analysing the relationships of patterns of resource to political economy forces (Mayer, 1996). Mayer (1996) notes that the effect of state policy and action are inherent in political economy, and are therefore a major concern of political ecology. Political ecology and health are closely linked in the sense that, it provides a useful perspective for gaining an understanding of human-environment interaction to cause an increase or decrease of traffic accident at various geographical levels (central versus local) and in different types of areas in developing countries.

In principle, the political ecology approach demonstrates how large-scale social, economic and political influences help to shape safe traffic environment in a place. Politics and resource allocation have a direct influence on all the factors that cause traffic accidents, be it the quality of the road network, traffic engineering, safety education, vehicle safety control etc.

Adequate resource allocation and cost effective investments to traffic system will result into effective and well-designed roads with separate lanes for pedestrians and cyclists (Vasconcellos, 2001), such roads are much safer than those without such facilities (Elvik & Vaa, 2004). Modern roads are safe because they are well designed with all-important safety signs (Graham, 1993). Poor traffic and environment management together with non-effective enforcement of the traffic code aggravates the risk of accident occurrences and severity (Elvik & Vaa, 2004). Poor visibility, difficult terrain, non-attractive surrounding, darkness and inclement weather conditions, and inadequate (or no) emergency medical services plays a great role in the severity of road accidents (Odero et al., 2003). Hence, shift in politics and resource allocation to such problems can play a significant role to make a difference (Watts, 2000; Walker, 2005).

Politics on the other side deals with social organisation. Safety in a place is socially and culturally organized (Amalberti, 2001; Zein & Navin, 2003). The use of resources also has some basis from

culture exhibiting the society. A resource is not a resource until when culture recognise the use of that particular resource. This means, a society can possess several resources that could be useful capital for the creation of road safety, if culture exhibiting a place does not recognise the use of technology, there will be no safety.

The traffic system is also a political institution organised within parameters of social rule systems (politics) that govern a particular society (Dekker, 2002). Politics is the governing of man through social rule systems (Simon, 2007). Social rule systems include institutions such as norms, laws, regulations, taboos, customs, and a variety of related principles in place. Traffic system without a social rule system cannot operate smoothly in a society.

The system of traffic rules, regulation and control is part of social rule systems specifically defined to enforce safe mobility within an area (Hollnagel, 2004). Political power is central to various enforcement mechanisms in a society (Emmerik-Van, 2001; Zimmerer & Bassett, 2003). Effective enforcement mechanism facilitates the orderly and timely flow of traffic (OECD, 2010; WHO, 2009).

3.5 Modernisation approach

Modernization approach is a theory used to explain the process of modernization within societies (Roberts & Hite, 2000). Modernization refers to a model of a progressive transition from a 'pre-modern' or 'traditional' to a 'modern' society. The theory focuses on the internal factors of a country while assuming that, with assistance, "traditional" countries can be brought to development in the same manner as developed countries have gone through (Roberts & Hite, 2000). Modernisation theory attempts to identify the social and technological variables that contribute to social progress and development of societies, and seeks to explain the process of social evolution.

Modernization approach maintains that traditional societies will develop as they adopt practices that are more modern (application of new technology). Modernisation is argued necessary or at least preferable to the status quo. This implies that, human agency controls the speed and severity of modernisation. Supposedly, instead of being dominated by tradition, societies undergoing the process of modernisation typically arrive at forms of governance dictated by abstract principles.

Traditional religious beliefs and cultural traits, according to the theory, usually become less important as modernisation takes hold.

The modernization concept is linked with increased mobility and rapid increase in the number of vehicles worldwide (Sheller & Urry, 2000). The rise of motorisation is considered as desirable socio-economic condition, viewed as the target of development (Bachmair, 1991). The perceived benefits and drawbacks of motorisation have been an important element of socio-economic system of modern people (Lash & Urry, 1994). Motorisation is a revolutionary process as it is in modernisation process. History indicates that, between 1910 and 1950 cars were concentrated in the USA, between 1950 and 1975 they became widespread in Europe and from 1960 onwards in the rest of the world, especially in Asia. In the process, the number of cars, trucks and motorbikes exploded from roughly one million cars in 1910 to 50 million (1930), 100 million (1955), 500 million (1985) and 777 million in 1997. It surpassed one billion in 2010 (Sheller & Urry, 2000). In addition, average driving distances expanded, further increasing overall traffic exposure.

Modernisation is a complex process. Traffic accidents that occur in modernized societies are considered an inevitable cost of the development process itself. In any case, the costs of traffic accidents are always outweighed by the benefits of increased motorization and, they can be tolerated to a certain degree (Button, 1993). Modernisation is the dominant culture that sustain major discourses of what constitute good life, what is necessary for an appropriate citizenship of mobility, and which provide potent literary and artistic images and symbols. This generally has led to global form of quasi-private mobility that subordinates other public mobility's of walking, cycling, or by rail etc. It recognises how modern people negotiate the opportunities for, and constraints upon, work, family life, leisure and pleasure.

Four facets can be used to explain the phenomenon; anthropological, political, psychological and economic, are put forward as a slogan of the increased demand for modern people to negotiate privately owned automobiles (Graham, 1993). Advocates of the anthropological facet state that automobiles are a symbol of power and status. People of a modernized society strive to attain the symbol. Proponents of the political facet state that automobiles provide privacy and complete freedom of mobility to automobile owners and users. The ownership and use of automobiles is regarded as an expression of people's freedom. Sympathizers of the psychological facet state that automobiles provide personal pleasure and self-reliance to automobile owners and users. Personal

pressure and self-reliance are cherished ideals in a modernized society. And, proponents of the economic facet state that automobiles are a fruit of technological development that allows for unprecedented mobility and provides the most efficient trip linking organization between trip origins and trip destinations (Graham 1993)..

The decision to purchase an automobile and, the resulting rejection of public transport, is a consequence of a rational comparison between the benefits and costs of several transport choices to satisfy mobility needs of a place. The privately owned automobile affords user unrestrained spatial accessibility and time savings in appropriating opportunities in a space economy. Unrestrained spatial accessibility and time savings are huge economic advantages in modernized society governed by rational decisions (Vaconellos, 2001)

Modernisation along with motorisation, both are systemic process, changes in one factor are related to and affect changes in the other factors. Tolerance of motorisation effects in modern society is powered by an extraordinary technical and social interlinkages with other industries, including car parts and accessories, petro refining and distribution, road building and maintenance, hotels, road side services, petrol stations and motels, car sells and repair workshops, sub-urban house building, Urban design and planning etc. In general, motorisation with its distinctive quality of its own, which would explain why modernity accept its positive and negative effect as a consistent whole. The various related components (industries, functions, demand) are highly associated with an economic development process (transition). A car-dominated society is prioritised.

Motorised travel is often said to have brought freedom and a better life to people and societies across the world (Fuller & Santos 2002). People adopt different roles over time: parent, teacher, student, shopper, businessman, tourist etc. These roles have range of different mobility requirements (Dekker, 2002). Consequently, people see the world differently depending on the role they fulfil and the identity they therefore take on (Dekker, 2002). In a modern society, the car is widely considered to be the obvious and desirable choice of transport (Fuller & Santos 2002).

3.6 The strength of applied theories in this study

Many attempts have been made to develop researches to predict or explain about the factors associated with the cause of road traffic accidents (OECD, 1997). Reviewing these researches, most of them do not have a strong theoretical basis, which guides the design of the studies and the interpretation of the study findings (Elvik, 2005). According to Elvik (2005), the lack of a strong theoretical basis for research means that few results of road safety evaluation studies can be ruled out on theoretical grounds. In this respect, there is an existing sharp contrast between road safety evaluation research and research in more theoretically mature disciplines (Wilde, 1982; Evans, 1991; Trimpop, 1996; Elvik, 2005).

Road traffic accidents are preventable and have similar systemic causes (Leveson, 2010). In other hazardous socio-technical systems in a society such as aviation, system theoretical assumptions are considered a promising way to better understand and manage safety (Larson, Dekker & Tingvall, 2010). In this case, the use of system theory in light of system thinking has provided a strong base of knowledge to guide this study. System approach has been used in two perspectives; first as a theoretical framework that provided link to important or major components constituting road traffic system, including a control mechanisms of the components that form an integrated whole (group cohesion). Secondly, it has been used as a framework to co-evolve with other set of theoretical perspectives concerned with the nature and characteristics of specific major elements constituting road traffic system. These include four theoretical approaches with relevance to geographical perspectives; 1) System approach guided by a modified heuristic model of safe traffic system, 2) Risk theory and cultural approach, 3) Political ecology approach and 4) Modernisation approach. A combination of these approaches is to overcome weaknesses that could be portrayed if only one theory is used. Wilde (1982), Evans (1991) and Trimpop (1996) suggest that, a comprehensive evaluation of road traffic accident research can be attained by associating more than one theoretical approaches or related concepts. Wilde (2002) also insisted that, complex studies such as road safety which involve more than one disciplines, demands multi-concept approach relevant to guide a particular study objective.

The modified heuristic model of safe traffic system considered that, not always the case that human behaviour needs to be influenced for a road safety measure to be effective. It is rather expansionist, which adage road safety as a system process and suggest road safety measure must influence one

or more risk factors that are associated with accident occurrence or injury severity, in order to affect the number of accidents or the severity of injuries. The concept of a causal chain in the model is strongly grounded by the philosophy of naturalism, realism, behaviourism and Marxism used to guide the study. A model provides a framework in creating a typology of risk factors associating with the causes of road traffic accidents. It provides a frame work to explicitly identify both contextual and compositional risk factors that influence risk-taking behaviour associated with road traffic accidents. In addition, it provides bases for analysing road safety measures that lead to behavioural adaptation among road users and their immediacy environment. The most lucid contribution from a theoretical perspective in the modified model of safe traffic system is the integration of the engineering effect and the system of traffic rules, laws, control and regulations. This has conceptualise the model to be more relevant and applicable to fit different context. The model can be used to guide road safety research in both high and low income countries.

Moreover, the application of geographical approach has marked a spatial pattern and geographical regularities to the study of road safety research and road traffic accidents. Stratification is a geographical approach that strengthened mechanisms to arise into legitimate, realistic and appropriate statements that can define or interpret individual's behaviour in a place.

CHAPTER FOUR

Research Design and Methods

4.0 Introduction

Methodology relates to the "ways of doing" or the principles and practices by means of which we acquire knowledge of phenomena we are interested (Kitchin & Tate, 2000; Holt-Jensen, 2001). Research methods and research methodology are not synonyms terms, they are quite different and have different meanings (Moran, 2000: Flick, 2000). Research method refers to a procedure, which is definite, established and logical (Flick, 2000), or a systematic way of accomplishing a research (Moran, 2000). Research methodology refers to a theoretical analysis of methods appropriate to a particular field of study or to the body of methods, which are used in a certain branch of knowledge (epistemology) (Holt-Jensen, 2001).

In most cases, epistemology and methodology of the study are highly intertwined (Creswell, 2008). Although epistemology does not determine methods, certain methods are associated with particular epistemologies (Flick, 2000). Methodology indicates an approach to conducting research that is underpinned by particular epistemologies for understanding how valid knowledge can be produced, and ontologies for understanding how the world is comprised (Gauch, 2003). Thus, methodology incorporate all aspects of research practice and theoretical perspective behind the methods (Flick, 2000).

Epistemologies and methodology related to how traffic accidents are researched in human geography are presented in chapter two. Theories (a base of knowledge guiding the study) are presented in chapter three. This chapter is indeed presenting methods and techniques used to accomplish the study underpinned by such particular epistemologies and theories. It is specifically discussing about how the primary and secondary data were collected, the instruments used and the means of analysing data.

The design of this study "Risk judgement, risk taking behaviour and road traffic accidents in Tanzania" is framed gradually to provide information that can contribute to reducing traffic accidents risk in Tanzania (refer to objectives of the study in chapter one). To accomplish the general objective and specific research questions of the study, the strategy of inquiry engaged both qualitative and quantitative approaches. The rationale for this triangulation approach was

determined by the philosophy of realism and system approach used to guide this study (Refer to chapter two & three respectively).

Realism recommends the usage of both methods (Subjective (descriptive & explanatory) and objective (exploratory)) in any research that seeks to establish how something happened, to what extent and what can be done to bring about changes (Holt-Jensen, 2001). In this study, subjective research questions were set to: 1) examine the judgments people make when they are asked to characterize and evaluate the danger of road traffic accidents, and to what extent risk perceptions, risk attitudes, risk willingness and risk taking behaviour is shared among individuals experiencing different levels of system risk (Urban, Semi-urban and rural). 2) Identify factors contributing to risk-taking behaviour and examine to what extent the identified factors can be attributed to compositional conditions in the geographical areas and to contextual conditions. While, objective research questions were set to 1) explore more understanding of the results from quantitative data and 2) to explore strategies in organizing and implementing road safety countermeasures in the country.

System approach (reflecting general consideration of multi causal factors) provided basis for framing mixed methods (seeking to understand multiple perspectives that may characterize human behaviour, road environment or means of transport (vehicles) to dysfunction mutual operation of the traffic system in a place). System approach emerged to the study of traffic accidents as a response to the failure of mechanistic approach to be able to explain social, social-technical and biological phenomenon (Skyttner, 2005). Mixed methods designs are an appropriate ideal technique to study complex system (Morse & Niehaus, 2009) and they are potentially offering feasible and information-rich data that can enhance traditional quantitative approach (Greene, 2007).

A sequential timing approach was used for data collection and data analysis (refer to table 4.1). There were two distinct phases for data collection and data analysis before a combined interpretation of the entire analysis. This design was generally a fixed method and partly an emergent method. According to Bazeley (2009), fixed method design occurs where the use of qualitative and quantitative methods is predetermined and planned at the start of research process, while emergent mixed method design occurs when a second (qualitative or quantitative) method is added after the study is underway due to issues that develop or emerges during the conduct. A

common practice indicates that, many mixed methods designs actually fall somewhere in the middle with both fixed and emergent aspects to the design (Greene, 2007; Hall & Howard, 2008; Morse & Niehaus, 2009).

The use of mixed method (triangulation) provides a chance to impose check and balances of the findings (Creswell, 2012), and it enables a researcher to gather evidence from multiple sources to address the questions at hand from different point of view (Baker, 1999; Teddlie & Tashakkori, 2009). One of the advantages of using mixed method (triangulation) is that it broadens the research and at the same time strengthens the validity of the research (Baker, 1999; Kitchin & Tate, 2000: Creswell, 2012). In this study, details about the association between dependent and independent variables in the quantitative findings have been deeply explored by qualitative data. Methodological flexibility by using mixed method has provided chance to accommodate information about participants' experiences especially on issues relating to social cultural environment.

Table 4.1 Strategy of inquiry (stages used for data collection and data analysis)

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Quantitative Data collection	Quantitative Data analysis	Qualitative Data collection	Qualitative Data analysis	Interpretation of entire analysis

Quantitative data took precedence; since it represents a major aspect of the data collection and all research questions are answered during stage 1 and 2 (refer to table 4.1). The qualitative data were collected and used to complement the quantitative data by providing more in-depth insight of mechanisms (of various types of determinants: culture, social, political etc.) and more understanding of the quantitative results. More specifically, qualitative data are integrated in objective number two. The connection between first and second objective is that, in objective number one, the underlying measure items for risk perception, risk attitudes, risk willingness and risk taking behaviour were computed to an index as composite factors. Whereas, in objective number two, the same computed factors are used. Risk taking behaviour is used as a dependent

variable, while risk perception, risk attitudes, and risk willingness are used among independent variables. Therefore, the integrated qualitative data in objective number two is also designed to provide more understanding of the pattern and tendencies of risk perception, risk attitudes, risk willingness and risk taking behaviour revealed in objective number one.

4.1 Quantitative Data

A significant role of the quantitative data in this study is central to the measurement scale used for 1) examining the judgement people make when they are asked to characterise and evaluate the risk of road traffic accidents, and 2) examining a set of factors influencing risk-taking behaviour of Tanzanian public on traffic.

4.1.1 A Questionnaire

The questionnaire (measurement instrument) used for the survey was developed as part of the project "Cross-Cultural perspective on Road Traffic Safety" (Coordinated by Prof. Torbjørn Rundmo, Dept. of Psychology (NTNU) and Ass, Prof. Stig Jørgensen, Dept. of Geography (NTNU)). The methodology of the project was partly based on the measurement instrument and knowledge from other projects of the same area, carried out in Norway (Iversen & Rundmo, 2004; Rundmo & Jørgensen, 2009; Lund & Rundmo, 2009; Nordfjaern, Jørgensen & Rundmo, 2011). In several studies on risk perceptions, risk attitudes, risk and safety culture, and risk taking behaviour in an occupational setting as well as in traffic and transport safety research.

Nordfjaern, Jørgensen and Rundmo (2011) have also previously tested the questionnaire in Ghana, India, Russia, Uganda and Tanzania. Their first study was to investigate cross-cultural differences in road-traffic risk perception, risk sensitivity and risk willingness in Norway, Russia, India, Ghana, Tanzania and Uganda. Differences in driver attitudes and drivers behaviours were examined. Their additional aim was to test whether the risk constructs and driver attitudes explained the variation in hazardous driver behaviour in those countries. Their second study investigated cultural and demographic predictors of car accidents involvement in a high income country in Europe (Norway) and three low income countries in sub Saharan Africa (Ghana, Tanzania and Uganda).

The relevance of the questionnaire to the present study (Risk judgement, risk taking behaviour and road traffic accidents in Tanzania) is that; the objectives of the present study are derived from the objectives of the main project "Cross-Cultural perspective on Road Traffic Safety" for which the questionnaire was designed. Foddy (1994) and Munn & Drever (2004) argue that: an intensive and well-designed questionnaire can be used to several other related surveys of similar or the same objectives. Mellenbergh (2008) notes that; even though questionnaire design has no theoretical base, validated questions used in other studies signify a good base of enquiry to cover several other objectives within targeted themes to be measured.

The original version of the questionnaire was in Norwegian language, English version of the questionnaire was developed in collaboration with local experts on Sub-Saharan African culture, language consultants and experienced researchers in Ghana and Tanzania. The English version of the questionnaire was also translated to Swahili in order to fit the Tanzanian public. According to Mellenbergh (2008), despite how good the questionnaire is for the survey, language background of the respondents is the key factor. Both English and Swahili questionnaires were used in Tanzania. English and Swahili are official languages in Tanzania (URT webpage 2012). In a similar case, the Swahili version of the questionnaire was translated by the authorised commission (Baraza la Kiswahili Tanzania, BAKITA) and reviewed by experienced researchers at the University of Dar es salaam.

Amendments of the questionnaire items were carried out after feedback from the pilot test. Inconsistencies and conceptual equivalence between original and translated versions of the questionnaire were carefully investigated. Items that were inconsistent were excluded from the questionnaire. For instance, items such as radiation risk and skiing risk which could be a substantial hazard in Norway (Nordfjærn et al, 2011), but is less likely to be a relevant in Tanzanian context. Nevertheless, differences in expressions, terms and possible misinterpretation may induce difference in answers assumed minor problem.

Advantages of using a pre-tested questionnaire include; 1) enough coverage of important aspects that could probably be omitted due to inadequate preparatory work, 2) obtaining the most complete and accurate information possible based on adjustments made to correct errors experienced from other pilot studies, 3) intensive hypothetical-deductive method in a survey (Leung, 2001; Munn & Drever, 2004; Mellenbergh, 2008; Gillham, 2008).

The variable test items in the questionnaire (excluding those related to demographic information and accident history in section six) were measured by a Likert scale format (interval scale) with five points ranging from very high probability to no probability; strongly agree to strongly disagree; most willing to no willingness; very often to never. The variable test items were made in form of statements in which the respondents were asked to evaluate according to their subjective or objective agreement criteria; this intended specifically to measure their level of agreement or disagreement. The measurement was symmetric and "balanced" comprising equal amounts of positive and negative positions in order to capture the intensity of their assessments. It is generally categorised as a psychometric scale format commonly involved in research that employs interval scale measurement in a questionnaire (Jamieson, 2004: Carifio & Rocco, 2007: Dawes, 2008: Norman, 2010). Likert scale format is one of the most common formats used to evaluate behavioural adjustment (Wuensch, 2005: Allen & Seaman, 2007).

Section one of the questionnaire is designed to measure attitudes towards traffic safety (traffic opinions about traffic safety). Iversen and Rundmo (2004) previously validated the measurement instrument. There are 19 statements (test items) related to road traffic attitudes. Respondents were asked, “To what extent do they agree or dis agree with the statements about traffic and driving in general?” For instance, ‘to maintain flow in traffic, one must ignore several traffic regulations’. The score scale ranged from 1-strongly agree, 2-agree, 3-neither/nor, 4-disagree to 5-strongly disagree. This specific section was designed to measure the level of road users’ attitude in traffic.

Section two of the questionnaire is designed to measure ‘risk judgement in traffic’. Rundmo and Jørgensen (2009) tested the measurement instrument. Based on their test; the probability measure of risk perception segmented into two factors; 1) accidents-specific situation and 2) role-related accidents. The former factor included items concerning probability of different types of road traffic accidents, such as the car running off the road, collisions with pedestrians etc. The later factor contains items related to the probability of accidents as a driver, pedestrian, passenger, pedestrian rider of a bicycle etc. In this study, the same factors were used. In the first part, respondents were asked “How probable is that you would be injured due to the following events?” 12 statements (test items) about role-related accidents were used. For instance, my car running off the road. The score scale ranged from 1-very high probability, 2-high probability, 3-neither/nor, 4 minimal probability to 5-very minimal probability. In the second part, respondents were asked, “If any of

these accidents should happen to you, how severe would the consequence be?" 8 measure items related to accident-specific situation were used. For instance, Head on collision. The score scale ranged from 1-very severe/fatal, 2- severe, 3-neither/nor, 4-minimal, 5-very minimal. This measure instrument is specifically designed to measure road users' perception about probability of being involved into traffic danger and being injured.

Section three of the questionnaire is designed to measure respondents' sensitivity towards risks 'judgement on other risks'. This measurement instrument was culturally adjusted version of an instrument which has been applied (validated) on previous occasions (Lund & Rundmo, 2009) based on Fischhoff et al. (1978). Rundmo and Jørgensen (2009) also tested the measurement instrument. The measurement instrument is set to measure; 1) a probability one should experience hazards such as handguns, floods, fire, war etc., and 2) a probability one should experience health injury in a hazard such as infected food, HIV, malaria, smoking, alcohol consumption etc. The former consisted 17 test items and the later 16 test items. The score scale for both categories ranged from 1-very probable, 2-probable, 3-neither/nor, 4 low probability to 5-very low probability. This specific section is designed to measure road users' perception of other health risk and danger.

Section four of the questionnaire is designed to measure respondents 'risk willingness' in traffic. Six test items validated by Lund and Rundmo (2009) are used. These items are set to measure how willing the participants are to take risk in various situations (e.g. at work, in road traffic and in their homes). The score scale ranged from; 1-most willing, 2-willing, 3-neither/nor, 4-likely not and 5-would not do it. This specific section is designed to measure road users' risk willingness when occupying different roles related to traffic.

Section five of the questionnaire is designed to measure 'behaviour as a pedestrian' in traffic. The overall guiding question states, "Approximately how often do you act as described in these statements?" 1. "Avoid walking on roads with traffic after dark" and 2. "Take risks in traffic". The response score scale is; 1-very often, 2-often, 3-sometimes, 4-seldom and 5-never. This specific section is designed to measure road users' behaviour as a pedestrian in traffic.

Section six of the questionnaire is designed to provide demographic information of the respondents. 16 categories of demographic information are listed; 1) gender, 2) year of birth, 3) civil status, 4) do you have children, 5) if yes how many, 6) affiliated religious community, 7) are

you literacy? 8) highest level of completed education, 9) occupational status, 10) what kind of area do you live in, 11) major occupation, 12) what region do you live, 13) monthly income, 14) do you have driving licence, 15) if yes which year did you get? 16) Do you have licence for another vehicle (e.g. buses, tuck etc.?) 17) If yes which year did you get? The relevant socio-demographic characteristics for the current investigation were respondent's gender, age, education, religious belief, area in which respondents are living (e.g. Urban, semi-urban and rural)

Section seven of the questionnaire is designed to measure 'opinions about culture'. 51 test items are used for the measurement. 45 measure items relates culture as symbol of exchange, and 6 measure items are based on destiny orientation. Klempe et al (2009) validated the measurement instrument relating culture as symbol of exchange. The measure instrument consists statements regarding oral and visual symbol exchange such as "I enjoy listening to stories, what is said always applies, I find that pictures give us the best stories" Respondents score scale ranged from; 1-strongly agree, 2-agree, 3-neither/nor, 4-disagree to 5-strongly disagree. Rundmo & Moen (2006) validated the measure instrument based on destiny orientation. The test items concerned the relative importance that the respondent attributed to religion and destiny for precautionary behaviour and as explanatory variable for accidents. For instance, "If everyone were religious there would be fewer traffic accidents or all human beings have destiny" The score scale ranged from; 1-strongly agree, 2-agree, 3-neither/nor, 4-disagree to 5-strongly disagree. This specific section is designed to measure the level of road users 'opinion about culture in traffic.

Section eight of the questionnaire is designed to measure respondents' 'traffic behaviour'. This section specifically targeted respondents who hold valid driving licence (legal drivers). In Tanzania a different criteria was used for the respondents to proceed with the section. A definition who is a driver in Tanzania was ambiguous. There were people who held a valid driving licence but could not drive. There were people without a valid driving licence and always drive. There were people with a valid driving licence who drive but could not locate where they were trained. There were very few people with proper training, a valid driving licence and were driving, lastly there were people without driving licence and were not driving. All these groups except the last were considered drivers in Tanzanian context and were allowed to proceed with section eight. The measurement of traffic behaviour consists of 27 test items. Rundmo and Jørgensen (2009) validated the measurement. The overall guiding question stated, "Research shows that most of us

violate some traffic regulations at one time or another. Approximately how often do you act as described in the following statements?" For instance, "slow down when there are pedestrians on the road". The score scale ranged from; 1-very often, 2-often, 3-sometimes, 4 seldom to 5-never. This specific section is designed to measure behaviour of drivers in traffic.

In general, the reliability and validity of these scales have been tested on several previous studies. Including; 1) A cross cultural comparison of road traffic risk perceptions, attitudes towards traffic safety and driver behaviour and 2) Cultural and socio-demographic predictors of car accident involvement in Norway, Ghana, Tanzania and Uganda by Nordfjaern, Jørgensen, & Rundmo (2011). The measurements of risk perception, risk attitude, risk sensitivity, risk willingness and culture have also been applied in Norway and other countries at several previous occasions (refer to Lund and Rundmo, 2009; Nordfjaern et al., 2011). Rundmo and Jørgensen (2009) found that, the reliability indices in terms of Cronbach's and mean correlated inter item correlation were satisfactory in Norway, Russia, India, Ghana, Tanzania and Uganda. The majority of the factors obtained alpha value around .70 and inter-item correlation above .30, which could be considered as satisfactory (Nunnally, 1978).

4.1.2 Sample size and sampling procedure

Probability sampling especially mailed questionnaire survey is commonly used in high-income countries (Berinsky, 2008). For instance, Nordfjaern, Jørgensen and Rundmo (2010) when conducting a cross-cultural study on traffic safety, they recruited a Norwegian sample by a mailed questionnaire, which was distributed to a randomly selected sample from the Norwegian population registry. However, they considered that, carrying out mailed questionnaire survey in low income countries such as Ghana, Uganda, India, and Tanzania was a challenging process, complicated and too resource demanding procedure. This is due to the fact that, a substantial number of people in such countries live without permanent address and mail system services. Hence, impossible to get access to complete address lists and carry out a random sampling. In addition, they also considered that return envelopes and paid postage generates relative high cost.

Therefore, a purposive sampling technique was used to select a sample of Tanzanian public to be studied (refer to table 4.2). When developing a purposive sample, researchers use their knowledge

or expertise about some group to select subjects who represent this population (Flick, 2000: Smith, 2001: Dillman et. al 2002: Berinsky, 2008; Lucas, 2012).

Table 4.2 Summary of the sample size and sampling procedure: (planed and actual sample)

Sampling Procedure		Focus
Before the field	Targeted population	Road users in Tanzania
	Targeted areas to be covered	Urban, semi-urban and rural areas in Tanzania
	Sampling technique	Non-probability sampling (Purposive / judgmental sampling)
	Sample regions	1. Dar es salaam region to represent urban areas 2. Arusha region to represent semi-urban areas 3. Shinyanga region to represent rural areas
	Planned sample size before survey (targeted sample)	N=600 Urban= 200 semi-urban= 200 and rural= 200
In the field	Adjustment during survey	During survey 1. Urban areas were re-categorised to areas covering Dar es Salaam city centre and Arusha city centre. 2. Semi-urban areas were also re-categorised and covered Arumeru district and Dar es Salaam periphery areas. 3. Rural areas covered Shinyanga rural district and Kahama rural district.
	Distributed number of questionnaires	1198 Urban= 538, Semi-urban= 401, Rural= 259
	Actual sample size collected	Total actual sample N=671 with response rate = 56% • Urban= 333 with response rate = 62% • Semi-urban= 218 with response rate = 54% • Rural= 120 with response rate = 46%
Response rate		56% overall response rate
Criteria used for selecting respondents		1. Reasonable gender balance compared to de facto composition in the total population 2. Reasonable age balance 3. Available and easy reached respondents (partly quota sampling) 4. Respective geographical areas based on parameters set (geographical stratification). 5. Reasonable education balance.

A sample of 671 respondents was successfully surveyed. 333 respondents in urban areas, 218 respondents in semi-urban areas and 120 respondents in rural areas. The overall response rate (completion rate or return rate) was 56%. According to Yun & Trumbo (2000), a survey's response rate is the result of dividing the number of people who were interviewed by the total number of people in the sample who were eligible to participate and should have been interviewed times 100 to make the results into percentage. In this survey, a total of 1198 questionnaires were distributed

to eligible respondents, 56% of the distributed questionnaires (671 out of 1198) were successfully field out and returned, 44.% of the distributed questionnaires (527 out of 1198) were due to respondents who were refrained to answer and missing for technical reasons (such as bad hand writing).

During the survey, some areas within specific sample regions were re-categorized due to criteria set to characterize each geographical area. Before field, table 4.3 indicates used criteria set for stratifying urban areas, semi-urban areas and rural areas. Theoretically, there is no fixed demarcations that differentiate exactly, urban, semi-urban and rural areas (Golledge & Stimson, 1997). These geographical areas (urban, semi-urban and rural) implicate a process and stage of economic and social development of a place (Golledge & Stimson, 1997). In most cases, spaces like population density, built up environment, settlement pattern, economic and social activities are among important factors to demarcate such geographical areas (Golledge & Stimson, 1997; Peet, 1998). In this study, characteristics of place relating to population density, road traffic system and common geographical demarcations were used to differentiate urban, semi-urban and rural environment. Therefore, during field, targeted sample regions especially Dar es Salaam and Arusha regions portrayed both urban and semi-urban characteristics. This demanded further stratification within the regions to distinguish areas that fit urban features and areas that fit semi-urban features.

Table 4.3 Stratification of urban, semi-urban and rural (criteria and actual sample areas)

	Used criteria	Urban	Semi-urban	Rural
Before field	Targeted sample regions	Dar es salaam region to represent urban areas. Dar es salaam is the largest city and commercial capital in Tanzania.	Arusha region to represent semi urban areas. Arusha is the tourist town with medium density residentially	Shinyanga region to represent rural areas. Shinyanga is the rural region with low and scattered settlement pattern.
	Population.	Considered areas with high population density and areas constituting more motorized road users.	Considered areas with medium population density, and areas constituting balanced road users between motorized and non-motorized	Considered areas with low and scattered population density. Areas constituting more pedestrian and cyclist
	Road traffic system	Complex road traffic system with high traffic congestion, several road signs, different types of roads (such as; one ways, two ways, low speed, high speed, junctions, roundabout, with lights and without etc.), diverse settlement patterns with different characteristics such as high density and low density residentially, complex business pattern such as shops, markets, garages, industries etc., high number of public areas such as schools, play grounds, religious areas, parking areas	Moderate road traffic system with a balance between the number of vehicles operating, road space and population demand. Low traffic congestion. Few road signs with mostly two ways roads, Medium density and low density residentially, medium number of public areas such as schools, play grounds, religious areas, parking areas	Simple traffic system with low and scattered population density. Very low and sometimes no traffic congestion. Very few road signs and mostly no road signs. Open settlement patterns with low density residentially. No complex business pattern, and low number of public areas such as schools, play grounds, religious areas, parking areas
	Geographical demarcation.	Cities, towns and conurbations to map urban areas	Areas characterized between town and village; somewhat but not wholly characteristic of town areas to map semi-urban areas	Villages and hamlets to map rural areas.
During field		Areas covering Dar es salaam city centre and Arusha city centre qualified to represent urban areas	Areas covering Arumeru district and Dar es Salaam periphery areas qualified to represent semi-urban areas.	Areas covering Shinyanga rural district and Kahama rural district qualified to represent rural areas

In that sense, regional centre of the semi-urban sample region where initially selected to represent semi- urban areas were finally uplifted to urban areas, and some periphery areas within urban sample region were re-categorized to semi-urban areas. Areas representing rural locations remained the same. Operationally; 1.Urban area covered areas within Dar es Salaam city centre and Arusha city centre. 2. Semi-urban area covered Arumeru district (which surrounds Arusha city centre) and Dar es Salaam periphery areas. 3. Rural area covered areas within Shinyanga rural district and Kahama rural district.

4.1.3 Characteristics of the sample

The actual sample (N=671) of Tanzania public consists; 35% females and 65% males. The pattern of age-group distribution represents 12% of respondents between 16-19 years, 18% between 20-24years, 43% between 25-34years, 17% between 35-44years and 10% above 45years. Table 4.4 indicates associated basis for gender and age group classification. In addition, 11% of the respondents used English questionnaire and 89% used Swahili questionnaire. 98% of the respondents are literate and only 2% could partly read and write. 41% completed primary and ordinary secondary school as highest level of education, 16% advanced secondary school education, 11% completed vocational training education and 33% completed university education. 55% of the respondents had formal occupation and 45% with informal occupation. 33% of the respondents possessed a valid driving license and 67% had no formal driving license.

Table 4.4-Associated basis for gender and age group classification.

	Planned sample group	Associated facts				
		Classification	**Target**	**Criteria**	**Strategy**	**Achieved**
Age-group	Below 19 years	To represent teens drivers	Around 10% of distributed questionnaire	Newly licensed teens: accident risk is particularly high during the first months of licensure in Tanzania	To surveyed secondary school students with driving license, also teens drivers of the motorbikes at the bus stops. Teens attending driving school.	12% of the actual sample
	20-24 years	To represent novice and inexperience drivers	Around 15% of distributed questionnaire	Traffic regulations in Tanzania accept this particular age group to drive private cars but not public and commercial. In addition their likelihood of risky driving behaviour is higher	To survey young drivers driving private cars and motorbikes parked at shopping centres, leisure areas, residential areas, and students with driving license at the university and other tertiary institutions.	18% of the actual sample
	25-34 years	To represent commercial and employed drivers (including public transport and private cars)	Around 45% of distributed questionnaire	Considered mature drivers. Majority of commercial and employed drivers are within this particular age group in Tanzania.	To survey drivers in both public and private institutions, bus stations, truck stations and to the taxies stations	43% of the actual sample
	35-44 years	To represent experienced drivers	Around 15% of distributed questionnaire	Considered experienced drivers	To survey people who poses driving licence or have been driving more than 10 to 15 years in public institutions, private institutions, residential areas, university, bus stations, truck stations, religious institutions	17% of the actual sample
	45 and above	To represent most experienced drivers	Around 15% of distributed questionnaire	Considered most experienced drivers	To survey people who poses driving licence or have been driving more than 20 years in public institutions, private institutions, residential areas, university, bus stations, truck stations, religious institutions	10% of the actual sample
Gender	**Planned sample group**		**Criteria**		**Strategy**	**Achieved**
	Male		Police report (2010) indicates; 70% of people driving in Tanzania are men, 98% of commercial drivers are men, 35% of drivers of the private cars are men and 66% of the registered driving licence in Tanzania are of men.		Approximately 2/3 of the distributed questionnaire	65% of the actual sample
	Female		Police report (2010) indicates; 30% of people driving in Tanzania are women, 2% of commercial drivers are women, 35% of drivers of the private cars are women and only 34% of the registered driving licence in Tanzania are of women.		Approximately 1/3 of the distributed questionnaire	35% of the actual sample

Police report (2010) indicates the risk of motor vehicle crashes is higher among 16-19 year olds than among any other age group in Tanzania. WHO report (2013) indicates, per mile driven specifically in high-income countries, teen drivers ages 16 to 19 are nearly three times more likely

than drivers aged 20 and older to be in a fatal crash. This definitely convinces that teens aged below 19 years are more likely than older drivers to underestimate dangerous situations or not be able to recognize hazardous situations. Drivers aged between 20-24 years are considered novice and inexperienced. Traffic regulations in Tanzania accept this particular age group to drive private cars but not public and commercial vehicles such as trucks or buses. In addition, police report (2010) classified drivers aged between 20-24 years as confident drivers and their likelihood of risky driving behaviour is higher than older age groups. The Traffic Act of 1973 recognises drivers aged between 25-34 and above as matured people and can be licenced to drive public buses, commercial vehicles and official vehicles. This particular age group constitute majority of drivers in Tanzania. Police report indicates 49% of the commercial and employed drivers (including public transport) are within 25 to 34 years. Parker et al (1995) argues that, driving experience is acquired through a period of time (that is driving period). Drivers aged between 35-44 who possessed a driving licence or have been driving not less than 10 to 15 years are considered experienced drivers, while those aged 45 years and above who possessed a driving licence or have been driving not less than 20 years are considered most experienced drivers.

Gender division female vs males in relation to licenced drivers or people who are driving in Tanzania is rationed 1 to 3 respectively. This to some extent indicates relatively more males engaging into driving than females. Based on official government statistics, 30% of people driving cars in Tanzania are women, 2% of commercial drivers are women, 35% of drivers of the private cars are women and only 34% of the registered driving licence in Tanzania are of women. This survey is only targeting people with valid driving licence or people who are driving. It is therefore convincing that, 1/3 of the sample size of the drivers should be women to make a sample representative.

4.1.4 Method related to quantitative data analysis

Quantitative data were analysed by using a Statistical Package for the Social Sciences (SPSS). SPSS is among the most widely used software for survey analysis (Wellman, 1998: Levesque, 2007). Data analysis by SPSS helps to efficiently identify and describe patterns in large amounts of data, patterns that improve our predictions about the unknown, explain the courses of

relationship, and allow us to exert influence over phenomenon we wish to control (Montello & Sutton 2006).

All the primary data obtained from the questionnaires were numerically coded and entered to an SPSS data file. The variable items were analysed as interval data in which their assumed distribution was normal, assumed variance was homogeneous and the usual central measure was mode. The main advantage/benefit of interval data analysis is that, it can draw more conclusions based on several tests, such as correlation test, t-test regression, and several factor analyses (Russell, 2002: Bandalos & Boehm-Kaufman, 2008: Bartholomew et. al 2008: Ritter, 2012)

4.1.5 Method related to specific objective number one

Specific objective number one was to investigate and compare pattern and tendencies of risk perception, risk attitudes, risk willingness and risk taking behaviour of Tanzanian public and its social demographic characteristics at different geographical areas (urban, semi-urban and rural areas). This aimed quantitatively, 1) to examine whether there is a relationship between physical environment and the judgement people make when they are asked to characterize and evaluate the danger of road traffic accidents. 2) To determine whether such relation could be influenced by demographic composition (such as gender and age group) of the population in a specific area.

The main hypothesis for this geographic analysis is based on the argument that, people living in areas experiencing different levels of system risk linked to urban, semi-urban and rural areas can also perceive and behave differently on traffic related risk in Tanzania. To test the hypothesis, a stratified analysis was designed to simplify the understanding of primary association of interest at different levels of potential confounding factors. Stratification is one way of simplifying reality so that the relationship between variables may be more clearly studied. Whereas a hypothesis might suggest a general relationship between two variables, stratification facilitate to a more detailed pattern and specific tendencies.

Four stratified analysis were laid down to intensively reveal the spatial pattern and tendencies of risk perception, risk attitude, risk willingness and risk taking behaviour in relation to geographical areas, gender and age group

- The first designed analysis is to examine whether geographical areas (context of urban, semi-urban and rural areas) can make a difference in risk perception, risk attitude, risk willingness and risk taking behaviour of road users in Tanzania. This was considered the main analysis of the objective number one, in which hypothesis can be tested, to determine further stratified analysis based on inter-individual differences (such as gender and age group) within specific geographical areas.
- The second, is a stratified analysis aimed to examine whether gender division (males and females) within a specific geographical area (either urban, semi-urban or rural) can make a difference in risk perception, risk attitude, risk willingness and risk taking behaviour of road users in Tanzania.
- The third stratified analysis is to examine whether age- group within a specific area can make a difference in risk perception, risk attitude, risk willingness and risk taking behaviour of road users in Tanzania
- The fourth analysis is based on a three levels of stratification: risk perception, risk attitude, risk willingness and risk taking behaviour of road users at different geographical areas, by controlling for their both gender and age groups. This intended specifically to check the significance of subgroups, which could influence the general significance of the main variable.

In the first analysis. Multivariate analysis of variance (MANOVA) was chosen as a relevant statistical method. The advantage of choosing MANOVA in this analysis is to obtain an overall significance of the model (to examine whether the independent variable had significant overall main effect on the dependent measures); 1) supposedly reduced type 1 error by testing the hypothesis, 2) revealing combined effect of the dependent variables and 3) their intercorrelations (among dependent variables).

Wilks' lambda as a test statistic was used to test whether there are differences between the means of identified groups of subjects. Wilks' lambda is a direct measure of the proportion of variance in the combination of dependent variables that is unaccounted for by the independent variable. In addition, the F-value, p-value, partial eta squared, descriptive statistics and post hoc test (Scheffe) were used to describe the pattern by comparing means of risk perception, risk attitude, risk

willingness and risk taking behaviour of Tanzanian public at different geographical areas (urban, semi-urban and rural areas).

The stratified analysis two, three and four were analysed by ANOVA as a relevant statistical method. One of the important considerations when designing stratified analysis is having enough sample size or statistical power to be split into small groups (Spector, 1992).

4.1.6 Methods related to specific objective number two

Specific objective number two was to find out, are there any remarkable factors constituting risk taking behaviour of Tanzanian public on traffic? If any, to what extent and how those factors are linked to physical and social cultural environment? To answer this research question two methods were triangulated; 1) the correlational method for modelling factors influencing risk taking behaviour and examine their variation effects by geographical areas (urban, semi-urban and rural). 2) Interviews for deep understanding of the reasons that govern such association (identified factors vs risk taking behaviour). The second approach is presented in the coming section of qualitative data.

Table 4.5 Methods used for specific objective number two

Specific objective number two	Correlational method	Interviews
To identify factors contributing to risk taking behaviour associated with traffic accidents and examine to what extent identified factors can be attributed to compositional condition in geographical areas and to contextual condition.	1. A stepwise multiple linear regression for modelling factors influencing risk taking behaviour 2. A multiple linear regression analysis to examine factors by geographical areas.	For deep understanding of the reasons that govern such association (identified factors vs risk taking behaviour)

A stepwise multiple linear regression method was chosen for modelling factors influencing risk-taking behaviour. This method (Stepwise regression) is a semi-automated process of building a model by successively adding or removing variables based solely on the t-statistics of their estimated coefficients (Spector, 1992). The advantage of using the stepwise regression method is

that, it puts more power and information at researchers fingertips than does the ordinary multiple regression option, and it is especially useful for sifting through large numbers of potential independent variables and/or fine-tuning a model by taking variables in or out (Howell, 2007).

In the steps of creating the best-fit model from a set candidate factors, statistical estimates, model fit, change in R square were selected for the output analysis of the model. In all the analyses, the 5% significant level ($\alpha = 0.05$) was used. However, also border significant findings were recorded for 0.05 – 0.10. The order of variables to be entered for the stepwise analysis were chosen based on three criteria used for ranking the strength of the association between the dependent variable and independent variables; 1) What theories suggest, including literature review from within geography and other disciplines, 2) objective of the study and 3) other factors e.g. insurance.

The second analysis (correlational method) was to examine explanatory factors by geographical areas. The focus was to examine their effect based on sample cases representing urban, semi-urban and rural areas. The file was split into three group of cases; 1) urban model based on cases for which geographical area is urban (sample of urban within Dar es Salaam city centre and Arusha city centre). 2) Semi-urban model based on cases for which geographical area is semi-urban (sample of semi-urban within Arumeru district in Arusha Region and Dar es salaam periphery areas). And 3) rural model based on cases for which Geographical area is rural (sample of rural within Shinyanga rural and Kahama rural villages).

Table 4.6 Split cases for regression analysis

A multiple linear regression	Sample cases	
Analysis 1	Urban model	based on cases for which geographical area is urban (sample of urban within Dar es salaam city centre and Arusha city centre)
Analysis 2	Semi-urban model	based on cases for which geographical area is semi-urban (sample of semi-urban within Arumeru district in Arusha Region and Dar es salaam periphery areas)
Analysis 3	Rural model	based on cases for which geographical area is rural (sample of rural within Shinyanga rural and Kahama rural villages)

In the regression statistical estimates, model fit, change in R square were selected for the output analysis of the models. The advantages of using multiple regression is that, it gives better prediction from multiple predictors, it helps to avoid picking/depending on a single predictor, and helps to avoid non-optimal combinations of predictors.

4.2 Qualitative Data

The qualitative data were collected after the survey and analysis of quantitative data. The main purpose was to explore more ideas and gain more insight into lifestyle, risk culture, values, meaning, motivations and behaviours of road users. More specific, to understand the reasons behind the results from quantitative research in specific objective number two.

Table 4.7 Specific areas targeted for exploring qualitative data

Purpose	Theme	Qualitative data
Specific objective number two	The assumption is, there could be a possible significant relationship between; 1. Religious belief and risk taking behaviour. 2. Risk attitude and risk taking behaviour. 3. Risk willingness and risk taking behaviour. 4. Geographical area and risk taking behaviour	To explore information that can contribute to deep understanding of the reasons and underlying conditions behind the association between each specific variable and risk taking behaviour.

The qualitative data created a chance of getting more information from other key informants outside the target audience in a quantitative survey. Hay (2000) and Walter (2006) noted that:

qualitative data can play a significant role when a researcher need to achieve a deeper understanding of the issues arose from quantitative data.

4.2.1 Research assistant

One research assistant was employed to assist in planning and taking notes while conducting interviews. A male, aged 32 years. He was by then a university student pursuing a master degree in Development studies at the University of Dar es Salaam. He had good research experience, was knowledgeable with good writing skills. His research topic for his master thesis was also about traffic safety.

4.2.2 Sampling procedure

A purposive sampling (refer table 4.8) accompanied by snowballing technique was used to select a sample of 37 informants for the interviews. Informants were categorised into two groups; Key-informants and Primary-informants. The difference between key informants and primary informants relates to their knowledge level of the road safety and their role-play in road safety issues in Tanzania. Key informants are experienced people, experts and leaders who to most extent have first-hand knowledge and they are engaged or participating in road safety activities in Tanzania. The purpose of key informant interviews was to collect information from responsible people or organisations considered important stakeholders in road safety issues. Experts or leaders, with their particular knowledge and understanding, can provide a significant insight on the nature of road accident problems and give recommendations for solutions. In this study, key informants were people who represented or spoke on behalf of their organisations, institutions or a group of people and not as individual's views. A significant role of their organisations in relation to road safety issues was first recognised. Key informants were given questions in advance before the interview. Targeted organisations were; 1) NGOs dealing with traffic issues; 2) responsible government institutions; 3) private sectors dealing with transportation; 4) traffic police; 5) government officials; 6) religious organisations; 7) insurance companies; 8) local authorities; and 9) professionals within transportation geography, psychology and engineering.

The primary informants were not particularly representing organizations but they represented in some way a larger group of individuals, their expertise, their experience and their own views. The purpose of including primary informant interviews was to explore a wide array of viewpoints and perspectives on road safety issues in order to reduce bias. Primary informants were not given questions in advance but informed about themes to be discussed. These included; pedestrians, drivers, professionals, and journalists.

A purposive sampling procedure was used to select both key informants and primary informants. Criteria used considered organisations dealing directly with road safety activities, professionalism, experience and individual role in relation to road safety issues. Purpose of the interview also had a significant role to select relevant informants including the number of informants to be interviewed.

Table 4.8 Planned sample and sample size for the interview

Type of informant	Organisation	Purpose of the interview	Number of informants
Key informants	NGOs dealing with traffic issues Responsible government institutions, Private sectors dealing with transportation, Traffic police, Government officials, Religious organisations, Insurance companies Local authorities, Professionals	To explore issues relating to 1. Road safety policy 2. Their key roles to road safety strategies 3. Institutional set-up of the leading agency 4. Problems of road safety 5. Government initiatives 6. Results from quantitative data 7. Possible strategies to combatting the problem of traffic accidents	At least 1 each organisation. A total of 8 key informants planned for the interviews
Primary informants	Pedestrians, Drivers, Persons with professional skills related to transport sector, civil engineers, teachers, psychologist, social science and health. Journalists,	To explore their personal opinion about road safety in their area, their experiences on traffic about attitude and behaviour, possible road safety strategies suiting their locality, and how they evaluate enforcement mechanisms within their areas.	10 drivers 10 pedestrians 6 professionals 3 journalists A total of 29 primary informants planned for the interviews.

Table 4.8 indicates planned sample and sample size for the interviews. Initially a total of 37 interviews were planned to be conducted. 8 interviews with key informants and 29 interviews with primary informants. Practically only 17 interviews were successful; 6 interviews with key informants (refer table 4.9) and 11 interviews with primary informants (refer table 4.10). Some interviews were counted as one but contained more than one informant. Main key informant in

some cases accompanied by assistant informant or co-informant. In general, the sample was regarded sufficient due to data saturation. It is common to experience a small sample in qualitative studies (Kitchin & Tate 2000). How many participants/cases are enough? The answer is "It depends!" According to Hay (2000) and Limb and Dawyer, (2001), there are no hard and fast number rules to represent the correct number of participants in a qualitative study. Hay has identified two general indicators of adequate participants: first is the extent to which the participants represent the range of potential participants in the setting, the second indicator is redundancy of information (when the researcher begins to hear the same thoughts, perspectives, and responses from participants, little more can be learned). This is referred to as data saturation (Hay 2010).

Table 4.9 Actual sample of key informants and their profile (consented to be published)

Type of Informant	Sex and Age	Place where they live	Description
Key informant	Male aged 48 years. Married with five children,	*Dar es salaam*	*He is an Engineer, He is holding a Master degree in Transport engineering, He is a Government official, Working as a manager(Roads department) at Surface and Marine Transport Authority SUMATRA, He is managing a department responsible for Road safety, Registration and licencing of Public transport, He is a board member of Public transport Authority, He lives in Dar es salaam, He is an experienced driver for almost 18 years, Transportation by road is his main carrier, He has been teaching at the National Institute of Transportation NIT for almost 17 years.*
Key informant	Male aged 52 years.	*Dar es Salaam*	*He is a Roman catholic priest, He has been a priest for 25 years, He has been broadcasting catechism teachings and Philosophy of religion in a radio programme (Radio Maria Tanzania) for almost 10 years, He lives in Dar es salaam, He is Administrator of Pugu spiritual centre, He is a Vocational director for youth and candidates of St. Benedict Brothers OSB, He is holding a degree in Theology and philosophy of religions, He has master degree in sociology, He is an experienced driver for 21 years.*
Key informant	Male aged 51 years. Married with 7 children,	*Kahama District. Shinyanga*	*He is a District administrative officer, He is the heady of budgetary committee at the district, He chairs the budget meetings for the district, He is responsible to provide health facilities to the district health centres, He is responsible for the safety issues at the district level, He has been a local authority leader for almost 20 years, He has lost one of his sons in a road accident (Head-on collision), He was very eager to participate.*
Key Informant	Male aged 56 years. Married with 4 children	*Dar es Salaam*	*He is an official at the ministry of Infrastructure Development. He is the Director and Head of the department of roads division and unit. He worked as a Principle officer at the same department for 10 years and later as the head of the department for 3 years.*
Key informant	Male aged 58 years. Married with 5 children	*Dar es Salaam*	*He is a Traffic Police Commander, He is a prefect of the traffic police unit, He is a permanent secretary of National Road Safety Council.*
Key informant	Male aged 57 years. Married with 2 children	*Dar es Salaam*	*He is the Chairperson of Tanzania Roads Association, which connects professionals from different disciplines to influence the Government on issues relating to safety roads and efficient transport system. He is a Civil Engineer by profession and He has been involved into several committee relating to safety engineering on road construction.*

The overview distribution of key informants indicates most of them were in urban areas. This is because road safety activities are centralized in Tanzania. Decision-making is from top down, this has also influenced the pattern of central offices to be allocated in urban areas. Most organizations including government institutions are located in Dar es Salaam and operate in all geographical areas. Some local leaders or experts located in rural areas could not speak on behalf of their organizations. When they were approached, they strictly hesitated to give information, in steady; they refereed all enquires to their central offices in Dar es Salaam to provide information.

A similar situation is portrayed with actual sample of primary informants who were interviewed. Most professionals are located in urban areas. Consideration about their representation was based on their experiences in all geographical areas. Some experts were found to be working in rural areas but considered themselves as urban residents. Most of the interviews with primary informants were conducted in Dar es Salaam, covering partly city centre and periphery areas of Dar es Salaam region. Few informants from Kahama district. The important factor that signify a sample of these qualified informants in Dar es salaam region to be a representative sample is that, majority of them are born and lived in rural areas before, they have been working in all geographical areas, they exercise their profession is in all geographical areas and also had a good knowledge about rural environment. The context of experiencing all kinds of traffic systems signifies a relevant exposure to represent other road users located at different geographical areas.

Table 4.10 Actual sample of primary informants (Consented to be published)

Type of Informant	Sex and Age	Place where they live	Description
Primary informant	Male aged 54 years. Married with two children,	*Dar es salaam*	*He is a lawyer by profession, He works at Legal and human right centre LHRC, He lives in Dar es salaam, He is a member of road safety committee representing Non-Governmental Organisations, He is an experienced driver for 32 years, He has been involved into road accidents for almost 11 times (3 accidents as a driver, 7 accidents as a passenger and 1 accident as a pedestrian)*
Primary informant	Male aged 53 years. He has two wives, 13 children.	*Dar es salaam*	*He is a driver by profession for 26 years, He has driven a taxi for 6 years, He has driven commuter buses for 4 years, He has driven Lories (Cross country) for 7 years and Public buses (Up country) for 9 years to date , He has an experience of long distance driving and short driving, He has experienced driving in Urban areas, Semi-urban areas and Rural area, He has been in both public and private sector, He has experienced several accidents in his work experience, He has experienced driving in neighbouring countries such as Kenya, Uganda, Rwanda, Burundi and Congo DRC.*
Primary informant	Female aged 47 years. She is married with 4 children	*Dar es salaam*	*She works with National Insurance company, She has been working as accident evaluator for almost 23 years, She is also a consultant for road accident evaluation for almost 10 years, she is holding an advanced diploma in risk management and a master degree in Disaster management, She lives in Dar es salaam, and she is an experienced driver for 15 years.*
Primary informant	Female aged 27 years. She is a single mother with 1 child.	*Dar es salaam*	*She is a psychologist and she works at the University of Dar es salaam Department of Education psychology, She lost two fingers in her left hand due to overturned car accident, she was involved in developing road safety curriculum for the primary school education. She is also a member of the project, researching about risk and disaster management. She lives in Dar es salaam.*
Primary informant	Female aged 37 years. Married with 2 children,	*Dar es salaam*	*She is a Traffic police, she has been working as a traffic police for 11 year, She has participated into several short courses about Traffic safety, She has wide experience concerning road safety issues in Tanzanian road system.*
Primary informant	Male aged 43 years. Married with 4 children	*Dar es Salaam*	*He is a secretary of the organisation (Tanzania Association of Non-Governmental Organisations) which represents NGOs, CBOs, Professional Organisations, Trade Unions, and religious Organisations. He has been an activist on issues relating to policy, good governance, safety issues and gender issues.*
Primary informant	Male aged 36 years.	*Dar es salaam*	*He is a lecturer at the National Institute of Transportation, Department of road safety and research. He has been teaching road safety courses for 6 years, He is a driver and a trainer for drivers upgrading their driving licence*
Primary informant	Male aged 63 years. Married with 6 children,	*Dar es Salaam representing Kahama constituency*	*He is a politician and member of the parliament, He represents Kahama constituency. He is a district committee member responsible for health safety and other development issues. He lost a son by car accident and he is an experienced driver for more than 15 years.*
Primary informant	Male aged 56 with 2 children.	*Dar es salaam*	*He is a journalist and editor of newspaper generated by Habari Corporation Company. He has been engaged in road safety programmes and possess a special page about road safety issues*
Primary informant	Male aged 38 years. Married with 3 children	*Kahama District. Shinyanga Region*	*He is a Traffic police at central post Kahama. He is a driver of the district police commander. He has an experience of 13years as a driver and 15 years as a traffic police.*
Primary informant	Female aged 46 with 4 children	*Dar es salaam*	*She is a layperson, she has an experience of been a pedestrian and a passenger when he lived in a rural area and eventually in urban area She is involved in a business which demands her to travel within and outside the city.*

An important note in this study is that, the informants consented to be published. Informants' cooperation was voluntary at all stages. Informants were told to whom the information would be supplied and the purposes for which it will be used. In addition, the informants were guaranteed that, their information would not be used for any non-research purpose. Due to their consent of

publishing their identity, the level of anonymity that have been accounted for is only hiding their names. Informants in this context wanted their voices to be acknowledged and were willing to have their identity made known alongside their contribution to the research.

4.2.3 Data collection

Qualitative researchers face many choices of methods related to data collection ranging from interviews, observation to reviews of documents (Creswell, 2008). In this study, three methods were used to explore qualitative data, this include; interview, focus group discussion and observation. These three qualitative methods are commonly used in human geography and other social science disciplines (Golledge & Stimson, 1997; Kitchin & Tate, 2000).

1) Interview

Interview is the most commonly used method for collecting primary data in qualitative research (Hay 2010). There are three fundamental types of research interviews: structured interviews, semi-structured interviews and unstructured interviews (Walter, 2005). Structured interviews are, essentially, verbally administered questionnaires, in which a list of predetermined questions are asked, with little or no variation and with no scope for follow-up questions to responses that warrant further elaboration. Unstructured interviews do not reflect any preconceived theories or ideas and are performed with little or no organization. Semi-structured interviews consist of several key questions that help to define the areas to be explored, but also allows the interviewer or interviewee to diverge in order to pursue an idea or response in more detail.

In this study, semi-structured interview within a framework of themes and guiding questions was used as a method to explore qualitative information from the informants. One of the advantages of using semi-structured interviews is that, it gives chances for the discovery or elaboration of information that is important to participants but may not have previously been thought of as pertinent by the researcher (Somekh & Lewin 2005). In addition, it gives informants the freedom to express their views in their own terms, it provides reliable and comparable qualitative data and it provides a clear set of instructions for interviewer to develop a keen understanding of the topic of interest (Walter, 2005).

The purpose of using semi-structured interviews in this study was to explore views, experiences, beliefs and/or facts from the informants about the results of quantitative data in specific objective number two and to explore relevant road safety strategies from people themselves that can best suit their environment. Qualitative methods are believed to provide a 'deeper' understanding of social phenomena than would be obtained from purely quantitative methods (Creswell, 2008; Hay 2010). Interviews are, therefore, most appropriate where little is already known about the study phenomenon or where detailed insights are required from individual participants (Denzin & Lincoln, 2005). They are also particularly appropriate for exploring sensitive issues of the topics in which participants may not get such chance when using a questionnaire, or where participants may not want to talk about such issues in a group environment (Creswell, 2008).

Interview guide questions were designed to cover themes which arose from the quantitative results specifically objective number two (for instance; the association between risk attitude and risk taking behaviour, the association between risk perception and risk taking behaviour, or the association between beliefs and risk taking behaviour). In addition, themes designed for determining road safety strategies (for instance, system of traffic rules and regulations, politics and governance of traffic system, participation, road safety policies etc.) in Tanzania. All themes/topics are grounded by research questions and theoretical perspective used to guide the study. Table 4.11 indicates some few examples of the interview guide questions in relation to themes and targeted informants. Complete guidelines are in the appendix 3, 4 and 5.

Table 4.11 Examples of used interview guiding questions

Specific target	Important themes to be covered	Guiding questions (semi-structured interview questions)
Informants from the organisations dealing with traffic issues	Participation as a system strategy of combatting the problem of traffic accidents (stake holders involvement)	• Do you have any activities linked to road safety? Can you describe them? • Why have you chosen such activities? What are motive behind? • Do you think the government is doing well enough to the problem of traffic accidents? How? • Who is to be blamed for the problem of traffic accidents? • Can you describe the problem of traffic accidents in Tanzania? • What do you think is the best way to approach the problem of traffic accidents? • Do you collaborate with other stakeholders in combating the problem of traffic accidents? How? • Do you get good cooperation from the government specifically on road safety issues? In which ways? • Do you use any government guide in approaching road safety activities in your organization? Can you describe what kind of guides they are?
Informants from faith-based organisations such as religious organisations.	Association between faith-values and behaviour on traffic	• Is there any association between religious values and traffic accidents • Do you think religious values and norms affect people the way they behave on traffic? How? • In what ways does the nature of your religion affect the way you drive? • Or in what ways does the nature of your religion affect the way you behave on traffic? • Are there any limitations for religious organizations to engage into activities that are not religious? • How do you interpret traffic accidents based on your religion? Who is to be blamed? • In your organization, how do you participate in combating the problem of traffic accidents? • Do you associate with government and other stakeholders in combating the problem of traffic accidents? • Do you think other religions are playing their role to the problem of traffic accidents? How? • Do you believe the government and other stakeholders do the right approach in combating the problem of traffic accidents? Do you agree with them? In which ways?
Informants from the government (government officials)	Government initiatives towards road safety, existing road safety policy, enforcement mechanisms	• What has been done by the government in combating the problem of traffic accidents in the country? • What is expected to be done by the government to combat the problem of traffic accidents? • Who is responsible to the problem of traffic accidents? How? • Is the government associating other stakeholder in combatting the problem of traffic accidents? • Are there policies for traffic safety? Can you describe them? • Are their specific traffic laws and regulation to enforce traffic safety in Tanzania? Can you describe them? How are they enforced?
Professionals (Psychologists, engineers, or designers of traffic related system)	Attitude in relation to road user behaviour.	• Can you describe any attitude traits of road users in relation to their daily behavior on traffic? • Do you think road users' attitudes and behavior pose danger to traffic safety in this area? In what ways? • Can you describe any attitude traits of road users in relation to traffic rule violation? • Does the road network and condition in this area influence how you or others behave in the roadway? • During the time you walk in the street, do you have any concerns with drivers who ply the road? Describe them! • Do you think the way you or others cross or walk in the roadway affect driving? • Could you describe what people who walk in the street do that you think can bring about traffic accidents? • Could you tell me why you think road users in this area behave that way? • Who do you think should be held responsible if a car kills a pedestrian? Why? • What is your impression about traffic law enforcement regarding road users in this area?

All interviews were conducted face to face by oral conversation. An interview guide was used to facilitate a framework for the performance of the interviews. While guiding questions helped to keep focus on what was supposed to be explored. Table 4.12 indicates how interviews with informants were conducted (Interview guide).'

Table 4.12 Stages and their specific guideline used to perform interviews with informants

Stages	Specific guideline
Before the interview	• Before interview session, enough information was collected about the informant or organisation and the specific subject to be interviewed. • The informant to be interviewed was contacted and informed about the research. The informants were also asked to propose a good time that will be convenient for the interview and where. A prior consent was also requested to the informant if it was possible to record the interview • Preparation for the interview was done together with the research assistant, this included orientation to keep time arranged for the interview, orientation of the questions, making ready all necessary equipment to document the interview,
During the interview	• Interviews were set to be covered between 30 and 45 minutes for the primary informants and between 60 and 90 minutes for the key informants. • Introduction was done to get to know each other; in addition, the main objectives of the research were introduced together with the ethical issues. • Semi-structured interviews based on conversation style (Open ended questions) were used to explore information from the informants • At the end of the interview, a winding up of what we have discussed and gained from the informant was done; the informant was given a chance to comment and agree whether it was correct or not based on what we have discussed sometimes to give additional information if possible or needed.
After interview	• After the interview, a little discussion with the research assistant was done and this included rewriting more information to add to the handouts taken during interviews, this is together with taking notes of surroundings during interview and expressions observed during interviews.

Preparation before the interview is considered a determinant factor of a successful interview (Bechhofer & Paterson, 2000). During the interview, the exchange of information is processed in which terms of reference such as time frame; objectives and mutual conversation are adhered to explore data. The process after interviews is to ensure important aspects are incorporated and reframing data ready for the analysis (Kvale, 1996).

2) Focus group discussion

Focus groups discussion share many common features with semi-structured interviews, but there is more in a group discussion than merely collecting similar data from many participants at once (Walter, 2005). One of the advantages of focus group discussion compared to other methods is that, it explores information on collective views, opinion and attitude, and the meanings that lie behind those views. They are also useful in generating a rich understanding of participants' experiences and beliefs (Kvale, 1996; Creswell, 2008).

In this study, one focus group discussion targeted specifically local government authorities. Kahama district authority was purposively chosen for two reasons; 1) in a survey, this district represented rural areas, therefore FGD within the areas was considered relevant to complement quantitative data obtained from the same area. In addition, the local government authority was aware about the project, this also simplified logistics in carrying out FGD in the area. 2) Lastly, the objective was to explore issues relating to power relations directly to a sample region representing rural areas, to what extend local authorities have the freedom to make their own decisions on road safety so they develop solutions that best suit their communities. Indeed, Kahama district had all qualities to represent other local authorities in Tanzania, it is not a regional capital, it is located in a remote area far from central government, trunk road connecting regions and neighbouring countries is also crossing the district, this gives them exposure to the problems relating to traffic accidents in their area.

A total of 9 participants were involved in the FGD meeting, including a researcher and research assistant. A contact person was the district commissioner and he was the one who appointed other participants whom he thought were relevant for the theme in a focus group discussion.

1. District commissioner, A male, aged between 50-55 years
2. District Police commander, A male, aged between 40-45 years
3. District Health officer, A female, aged between 40-45
4. District Development Director, A female, aged between 50-55 years.
5. District Engineer, A male, aged between 40-45 years
6. District Transport Manager, A male, aged between 40-45 years and
7. Traffic Police Officer. A female, aged between 30-35 years
8. 1 researcher and
9. 1 research assistant.

According to the District Commissioner, the criteria used to select the participants was based on their relevant roles in relation to traffic safety and position they held within the structure of local government authority. Walter (2005) recommended a small group of people usually six to eight for effective focus group discussion. Patton (1990) also Somekh & Lewin (2005) argue that, there will be more credibility of the information in a focus group discussion if relevant people are chosen for the topic they are responsible.

Along with interview guide (refer table 4.13), a guiding structure (refer table 4.14) was used to conduct a focus group discussion at Kahama district with local authorities:

Table 4.13 An interview guide used to conduct a Focus Group Discussion

Theme	Interview guide questions
Power relation on decision making and resource allocation (budgeting) on road safety activities or strategies at local level	• When you think about traffic accidents in your district, who do you think is responsible for controlling road traffic accidents in your district, how? • Do you have any activities linked to road safety in the district? Can you describe them? Who is funding them? From which source of income? • Do you think you are doing well enough to the problem of traffic accidents? How? • Can you describe some limitations of your authority in combating the problem of traffic accidents? • What do you think is the best way to approach the problem of traffic accidents in your district? • Do you collaborate with other stakeholders in combating the problem of road traffic accidents? How? • How do you associate with central government specifically on road safety issues? • Do you have any guide or secular in approaching road safety activities in your district? Can you describe what kind of guides they are? • Do you associate people in your district in approaching the problem of traffic accidents? How are they involved? • How do you finance road safety activities in your district? Is there a specific budget plan? How is it organised? • How do you approach the problem of traffic accident if an accident has happened within your district? Can you describe a procedure? • Is there anything else you would like to say about the issues of traffic safety in your district?

The overall objective of the focus group discussion with local authorities as key informants at Kahama district was to find out to what extend local authorities have the freedom and power to make their own decisions on road safety strategies so they develop solutions that best suit their community. On the other side, it was also targeting informants representing rural areas.

Table 4.14 A guide structure used to conduct a Focus Group Discussion

Before the session:	• *Rehearsal was done based on the ground rules of conducting FGD, such as aiming for equal participation, respect for others, polite languages etc.* • *Appropriate seating arrangements was organized*
Introduction:	• *A welcome note was presented and appreciation note for participant attendance was acknowledged.* • *In addition introduction of the participants was also done*
Establishing agenda:	• *The main purpose of the focus group discussion was presented including the purpose of the research*
Main session	• *Questions from the interview guide were posed one by one for the discussion.* • *Moderation on differences in the discussion was controlled by promoting even participation*
Closing the session:	• *Winding the discussion by summarizing what was discussed in the meeting.* • *All participants were acknowledged for their time and valuable expertise* • *The meeting was closed.*
After the session:	• *Additional notes and observations that came as a surprise to the discussion was documented.*

A guided structure is an important instrument to moderate the session in sequential program. It gives clues to a moderator or facilitator of what is next to be accounted for in a period process.

3) Other meetings

In addition, there were several other meetings, which were set to verify some of the important issues relating to road safety situation in Tanzania. These meetings were done during a survey (quantitative data collection). The meetings (refer table 4.15) involved a team of researchers and important parastatal organisations responsible for the road safety issues in Tanzania.

Table 4.15 Other meetings during a quantitative data survey

Researchers	Institution	Host (Informants)	Purpose
• Prof. Torbjørn Rundmo (Department of Psychology, Norwegian University of Science and technology) • Ass. Prof. Stig Jørgensen (Department of Geography, Norwegian University of Science and technology) • Dr. Jovita Katabaro (Department of Psychology, University of Dar es salaam) • Dr Cosmas Sokoni (Department of Geography, University of Dar es salaam) • Deus Komba (Department of Geography, Norwegian University of Science and technology)	Tanzania Institute of Education (TIE)	Three officials from the department of curriculum development	Information about road safety curriculum in schools and colleges in the country
	National Institute of Transportation (NIT)	Ten Lecturers from the departments of road safety, high way engineering, traffic plans, traffic research, traffic laws, and vehicle control.	Issues relating to transport sector in Tanzania including challenges and research.
	Surface and Marine Transport Authority (SUMATRA)	Two officials from surface department, which includes transport by road and licencing.	Issues relating to licencing, Transport plans, challenges in the transportation sector.
	Traffic Police (CENTRAL)	National Traffic Police Commander, who is also a secretary of the National Road Safety Council in Tanzania	Issues relating to Traffic law enforcement, performance of NRSC and encountered challenges of the traffic police
	Dar es salaam University College of Education (DUCE)	Principle of the college, who is also a body member of the National Road Safety Council in Tanzania.	Issues relating to NRSC, Participation of other stakeholders to NRSC and road safety research.

The aim of the meetings (with these parastatal organisations and government officials) was to seek the government views on the issues relating to traffic safety and traffic accidents in the country. Walter (2005) and Hay (2010) have noted that, getting an access and exposure to authorised audience can provide more insight to the research topic.

4) Personal observations.

The ways of participating and observing can vary widely from setting to setting (Hay 2000). Participant observation is a strategy of reflexive learning, not a single method of observing (Limb & Dawyer, 2001). In participant observation researchers typically become members of a culture, group, or setting, and adopt roles to conform to that setting (Hay 2000). In doing so, the aim for the researcher is to gain a closer insight into the culture's practices, motivations and emotions. It is argued that the researchers' ability to understand the experiences of the culture may be inhibited

if they observe without participating. By participation, rich information and awareness about a phenomenon can be obtained through direct personal observation (Walter, 2005).

All together (research team (Prof. Torbjørn Rundmo (Department of Psychology, Norwegian University of Science and technology), Ass. Prof. Stig Jørgensen (Department of Geography, Norwegian University of Science and technology). Dr. Jovita Katabaro (Department of Psychology, University of Dar es salaam). Dr Cosmas Sokoni (Department of Geography, University of Dar es salaam). Deus Komba (Department of Geography, Norwegian University of Science and technology). We had time to move around and observe the operation and characteristics of traffic system in Dar es Salaam city and the areas along high way road from Dar es Salaam to Arusha (villages, and towns through Coast region, Tanga region, Kilimanjaro and Arusha). Table 4.16 indicates important features targeted to be observed.

Table 4.16 Targeted issues for observation when driving in Tanzania

Driving Route	Targeted issues
Within Dar es salaam city	Road signs, traffic separation, pedestrians crossings, speed bumps, how pedestrians are crossing the roads, driving behaviour, enforcement mechanisms, how traffic police are controlling traffic, congestion in the city, how motorcyclists interact in the traffic, vehicle conditions in terms of age, operation of commuter buses, speed limits at different areas, settlement pattern, safety furniture's along the roads, parking areas within city centre, accidents happened along the roads, the use of traffic lanes, overloading of cargos, overloaded passengers in the commuter busses, posters on vehicles and their messages, signals and communication between drivers on traffic, children crossing roads, disabled crossing roads, how drivers are respecting traffic signs especially zebra crossing, cyclists within the city and outside the city, quality of roads, pavements, disabled signs on parking areas, pollution such as high volume of music sound in some vehicles especially commuter buses, the use of seat belts etc.
From Dar es salaam, through Tanga region, Kilimanjaro region to Arusha	
Within Arusha city centre and Arumeru district.	

Being all together in one car led us to have informal discussions about several events we identified to be a risk leading to traffic accident, for instance overloading vehicles, over speeding, some vehicles used pedestrians roads to overtake and how pedestrians crossed the road everywhere. By having, a team with very high qualifications the discussions enabled me to learn and gain more on issues that gave a very strong background of my study, relating to road users attitudes and risk taking behaviour through examples we were directly observing on traffic.

4.2.4 Methods related to qualitative data analysis

The analysis of qualitative data was based on Dey's approach (1993) (refer table 4.17). Dey's approach in analysing qualitative data suggests three stages: the description of the data, the classification of the data and seeing how concepts interconnect.

In this analysis, data were first coded based on themes emerged from the quantitative data in specific objective number two and stipulated themes to cover specific objective number three, they were secondly sorted and filtered based on their relevance. Lastly, data were interpreted based on their connections to the themes. Even though the most common analysis of qualitative data is observer impressions (Patton, 1990: Cresswell, 1994: Limb & Dawyer, 2001), the qualitative data in this case aimed to create deeper understanding of the quantitative data as well as peoples' opinion on relevant road safety strategies that best suit their context. Limb & Dawyer, (2001) and Hay (2000) argue that, analysis of qualitative data is an art; a researcher can use any style drawn from others but not necessarily uniform explanations. In a similar case, Kitchin & Tate (2000) also Hay (2010) argue that, qualitative data are not as rigidly defined as quantitative data and analysis lacks the formal rigour of standardised procedures.

Table 4.17. Stages used to analyse qualitative data

Stage one	Description	Making data in a form that can be easily interpreted (Theme coding is a technique used)
Stage two	Classification	This was a process of sorting and filtering data based on their relevance (which factors are important or more silent). It involved interpreting and making sense of the data.
Stage three	Connection	Making connections between qualitative data and themes arose from quantitative data as well as themes designed to cover research objective number three. This involved understanding their relationship and their associations for the interpretations. (including connections to other topics within specific objectives)

Source: *Modified from Dey's approach in analysing qualitative data (1993)*

The key issues focussed on stage one were; 1) the primary message content; 2) the evaluative attitude of the informant towards the message; 3) whether content of the message was meant to

represent individual or group of people and 4) the degree to which informant is representing reality in relation to hypothetical experience.

Stage two was more or less a deductive approach, research themes arose from quantitative data and those designed to answer research question number three were used to group data based on their similarity and differences. This is quite common approach in social studies when the qualitative research is a small component of the larger quantitative study (Creswell, 2008).

In the stage number three, a set of interrelated concepts, definitions and propositions that presents key themes of the study as a systematic view of events were used to specifying relations or connection among variables. The focus is not looking for objective meaning of text, but meaning of text for people in the given situation. Themes were described in a social situation and the cultural patterns of informants within their localities. For instance, one theme was "modernisation and rapid increase in the number of vehicles in Tanzania" informants said that, "*you can`t be successful to your business in town if you are not mobile, owning a private car is now one of the basic needs in a house like a kitchen or toilet"….* The social context of the message in connection to the main theme implies that, Auto mobility in modern society (referred as town) is a basic need and not a luxury. The interpretation of this connection based on theoretical perspective, suggests that, Auto mobility provides privacy and complete freedom of owners, therefore people living in towns and cities fight for mobility freedom.

4.3 Validity and reliability of the quantitative data

Validity refers to the degree to which a study accurately reflects or assesses the specific concept that the researcher is attempting to measure. While reliability is concerned with the accuracy of the actual measuring instrument or procedure in a study or the degree, to which an assessment tool produces stable and consistent results

In this study, quantitative survey stands as the main source of data, hence, much effort on the procedure for data collection and data analysis were focused to adhere to the rules associated with quantitative research. This was to make sure that the results of the study would eventually create valid inferences to a wider population. One of the adhered principals on quantitative data analysis

is the factor analysis. Factor analysis is a statistical method used to describe variability among observed, correlated variables in terms of a potentially lower number of unobserved variables called factors (Bryman & Cramer, 2009). Factor analysis originated in psychometrics and is used in behavioural sciences, social sciences, and other fields that deal with data sets where there are large numbers of observed variables that are thought to reflect a smaller number of underlying/latent variables (Howell, 2007; Bryman & Cramer, 2009)

Exploratory factor analysis; It was considered that single item-measures used to define risk perception, risk attitude, risk willingness and risk taking behaviour will be more reliable and valid if they are computed to an index. To achieve this, exploratory factor analysis was applied. Exploratory factor analysis is a technique within factor analysis whose overarching goal is to identify the underlying relationships between measured variables (Howell, 2007). This statistical technic is normally used to uncover the underlying structure of a relatively large set of variables. Hence, the application of this technique, a great number of single measure items used to define risk perception, risk attitude, risk willingness and risk taking behaviour was reduced to an index.

Measure of internal consistency; Cronbach`s Alpha was applied as a model of internal consistency. Cronbach`s Alpha is the most commonly used statistic for estimating a test reliability (Coolican, 1999). The model of consistency facilitates the degree, to which an assessment tool produces stable and consistent results.

Regression analysis; Regression analysis was applied in order to examine the relationship between a specified set of explanatory variables and dependent variable. Standardised regression coefficients such as Beta values, Adjusted R square, and P-value were used to define model fit. Beta coefficients are the estimates that have been standardized so that the variances of dependent and independent variables are 1 (Bryman & Cramer, 2009). The use of Beta coefficient is to check how many standard deviations a dependent variable will change, per standard deviation increase in the independent variable. In addition, it advocates note that the coefficients ignore the independent variable's scale of units, which makes comparisons easy. The adjusted R-squared provides the percentage of variation explained by only those independent variables that in reality affect the dependent variable. One of the advantage of using the adjusted R squared is that, it compares the descriptive power of regression models that include diverse numbers of independent

variables. Whereas the P-value is used for testing statistical hypothesis. A small p-value (≤ 0.05) indicates strong evidence against the null hypothesis, so it is rejected. A large p-value (> 0.05) indicates weak evidence against the null hypothesis (fail to reject). In general, the p-value is a function of the observed sample results (a test statistic) relative to a statistical model, which measures how extreme the observation is. Thus, the p-value indicates the probability whether the observed result has nothing to do with what one is actually testing for. The use of such standardised coefficients is partly **a confirmatory factor analysis** to determine the ability of a predefined factor to fit an observed set of data by establishing the validity of a single factor to variety. Model fit refers to the ability of a model to reproduce the data.

Triangulation: In order to strengthen the validity of the research and the credibility of the results, qualitative data are used to support and provide more detailed and balanced picture of the situation. The use of triangulation method in this study was to reduce the bias that will be caused by choosing one method over the other. In this regard, more evidence from multiple sources to address the research questions from different point of view including the interviews was applied.

4.3 Validity and reliability of the qualitative data.

The validity and reliability of qualitative data relates to the quality of research design and process that enhance data collection (Lincoln & Guba, 1985). The trustworthiness of qualitative research generally is often questioned if important basis for its validity and reliability cannot be addressed (Yin, 1994). Lincoln & Guba (1985) proposed constructs that can inform trustworthiness in qualitative research projects; credibility (in preference to internal validity); transferability (in preference to external validity/generalisability); dependability (in preference to reliability); and confirmability (in preference to objectivity).

In this study, the use of the quantitative results as a baseline measure for collecting qualitative data provides a credible internal validity of the qualitative research. Silverman (2005) argues that, results from other methods can significantly inform how congruent the findings are with reality. In general, the methods used for quantitative data collection were well established and have been

used and tested by several other researchers. Yin (1994) recognises the importance of baseline questions to provide strong internal validity of the qualitative research.

Triangulation method used to collect qualitative data (observation, focus group discussion and individual interviews) also contribute to internal validity of the qualitative research. According to Lincoln and Guba (1985), the use of different methods in concert compensates for their individual imitations and exploits their respective benefits. Another form of triangulation used in collecting qualitative data in this study, is the use of different types of informants; primary and key informants. In this case, individual viewpoints and experiences were verified against others and, ultimately, a rich picture of the attitudes, needs and behaviour of road users in Tanzania.

The use of key informants was also one of the tactics to collect reliable data. In particular, key informants represented their organisations, they spoke on behalf of the organisation and information explored was not based on the individual's opinion or views. Hay (2010) argues that unlike quantitative researchers, who apply statistical methods for establishing validity and reliability of research findings, qualitative researchers aim to design and incorporate methodological strategies to ensure the 'trustworthiness' of the findings. Such strategies include qualified informants or getting information from responsible authorities in a group or organisation.

Informants consent to participate in this research is also considered one of the important elements that provide credibility of qualitative data. Lincoln & Guba (1985) argue that, Informant consent is to ensure that the data collection sessions involve only those who are genuinely willing to take part and prepared to offer data freely. According to Lincoln and Guba, willingness is an important indicator of trustworthiness. Each informant who participated in this research was approached and given opportunities to either refuse or accept to participate in the research.

In general, qualitative data were mainly collected as supportive data to provide more understanding of the quantitative results. Therefore, dependability, transferability and confirmability of the qualitative data also implicate mechanisms constituted the validity and reliability of quantitative data. Transferability in this context refers to background data (quantitative results) used to establish context of qualitative data and detailed information used to verify and provide a wide contextual meaning of the quantitative results. Dependability is linked to the employment of

overlapping methods such as interviews, observations and focus group discussion, which largely have allowed previous findings (quantitative results) to be repeated. Confirmability therefore is the use of triangulation approach that to a great extent; reduced effect of biasness, recognition of shortcomings of using one method and the potentiality of qualitative data to provide in-depth understanding of the quantitative data.

4.4 Methodological issues

Social desirability biasness.

Social desirability biasness is the tendency of surveyed respondents to answer questions in a manner that will be viewed favourably by others (Stoeber, 2001). This situation is one of the common methodological problems related to the use of self-report data, especially questionnaires. Some reasons for response bias could be due to; a deliberate attempt of respondents to present a preferred image of themselves, an in-built tendency of respondents to answer yes or no, or a respondent does not know the answer to the question (Moen, 2008). In this study, the questionnaire has been used for 1) examining the judgement people make when they are asked to characterise and evaluate the risk of road traffic accidents, and 2) examining a set of factors influencing risk-taking behaviour of Tanzanian public on traffic. Even though questionnaires are criticised due to response bias (Shapiro et al., 1998), there are many advantages of self-ratings with a questionnaire; 1) the accuracy of individual responses (Shapiro et al., 1998; Munn & Drever, 2004) and the nature of self-ratings is assumed best for accurate memory of events and willingness of respondents to report their experiences to the researcher (Breakwell et al., 1995).

This study did not control for responding biasness, and cannot rule out the possibility of biased responses. However, this was assumed as a minor problem because most of the questions related to general risk did not involve respondent`s self-reported driving behaviour. Moreover, the use of a pre-tested questionnaire is one of the advantages of obtaining the most complete (simple and relevant questions) and accurate information possible based on adjustments made to correct errors that may lead to response biasness experienced from other pilot studies. A pre-tested questionnaire in a survey can lead to a significant amount of reduced response bias (by the use of simplified questions and adjustments made to correct ambiguous questions) that could probably be overseen before a pilot test.

Response rate.

A completion rate or return rate of questionnaires in a survey study is commonly referred as response rate. According to Yun et al. (2000), a survey's response rate is the result of dividing the number of people who were interviewed by the total number of people in the sample who were eligible to participate and should have been interviewed times 100 to make the results into percentage. Low response rates and non-response bias are considered methodological problems in conducting a questionnaire survey (Yun et al., 2000). A systematic difference between respondents and non-respondents is assumed as a threat that could probably influence the external validity of the results (Moen, 2008).

Even though, Iversen (2004) conducted a study of non-respondents in the Norwegian public and did not find a substantial difference between respondents and non-respondents. It could be that, the distribution of gender, age group, education and geographical areas of the samples reduced differences between respondents and non-respondents. According to Moen (2008), the important question is to consider how a drawn sample is representative and whether the results of the thesis can be generalised to the population. In this study, a sample of 671 respondents was successfully surveyed. 333 respondents in urban areas, 218 respondents in semi-urban areas and 120 respondents in rural areas. The overall response rate (completion rate or return rate) was 56%. In this survey 44.% were due to respondents who were refrained to answer and missing for technical reasons (such as bad hand writing), otherwise shortcoming on sampling procedure (partly quota sampling and purposive sampling) was overcome by replacing other (willing) or refereed respondents.

Causation

Accidents as malfunctions of traffic system cover a wide range of causation: from minor accidents to highly improbable failures. Some factors contribute to the occurrence of a collision and are therefore part of accident causation. Other factors aggravate the effects of the collision and thus contribute to trauma severity. Some factors may not appear to be directly related to road traffic injuries. Some causes are immediate, but they may be underpinned by medium-term and long-term structural causes (such as physical and social cultural environment (settings)). One of the

methodological limitations identified by cook & Campbell (1986) is that, many of the causal assumptions postulated by social studies are difficult to investigate by controlled experimental method. It is rather assumed that, assumption about causality are more often fulfilled in studies within the natural sciences.

However, the analyses and reported results in this study are rooted in theory and other previous empirical work. System approach to the study of traffic accidents comprises independent structures such as means of transport (vehicles), environment (roads) and people (road users), these structures are interrelated and dependent on each other in a causation of an event (accident), these structures defines what generally traffic system is made of. System approach to the study of traffic accidents is empirically natural (Elvik & Vaa, 2004). This implies that, its application in social science is essentially the same as that in the natural sciences.

Likert scale format

Likert scale format is one of the most common scale formats used to evaluate individuals behaviour (Wuensch, 2005: Allen & Seaman, 2007). It is generally categorised as a psychometric scale format commonly involved in research that employs interval scale measurement in a questionnaire (Jamieson, 2004: Carifio & Rocco, 2007: Dawes, 2008: Norman, 2010). In this study, the variable test items in the questionnaire (excluding those related to demographic information and accident history in section six) were measured by a Likert scale format (interval scale) with five points ranging from very high probability to no probability; strongly agree to strongly disagree; most willing to no willingness; very often to never. The variable test items were made in form of statements in which the respondents were asked to evaluate according to their subjective or objective agreement criteria; this intended specifically to measure their level of agreement or disagreement. The measurement was symmetric and "balanced" comprising equal amounts of positive and negative positions in order to capture the intensity of their assessments.

One of the methodological limitations of using a Likert scale format is that, respondents may behave differently in relation to Likert scale format. Some people may be modest and prefer the centre point of the scale; some people may be extreme and prefer the end point of the scale. Nordfjærn et, al., (2011) identified such response biasness could be relevant particularly to

individuals across different geographical areas and cultural contexts. This study cannot rule out such limitations due to individual differences based on their geographical areas. The geographical contexts of urban-rural difference have a significant impact to individual differences in subjective risk judgement (Eiksund, 2009). However, in this study, details about the association between dependent and independent variables in the quantitative findings have been deeply explored by qualitative data. Methodological flexibility by using mixed method has provided chance to accommodate information about participants' experiences especially on issues relating to social cultural environment. One of the advantages of using mixed method (triangulation) is that it broadens the research and at the same time strengthens the validity of the research (Baker, 1999; Kitchin & Tate, 2000: Creswell, 2012).

4.5 Theoretical issues

The scientific approach to road safety in recent decades has evolved from blaming the victims to safe systems (Elvik, 2001; Johnston, 2009; Salmon et al., 2012). The term safe system represents the current consensus of what constitute best practice strategic thinking in road safety (OECD, 2008; Salmon et al., 2012). It builds upon Swedish evolution of road safety strategies (Vision Zero) and Dutch principles of sustainable road safety. The vision seeks to prevent crashes, or at least, to reduce crash severity to a point where (severe) injury risk is eliminated (Tingvall & Haworth, 1999). Humans are fallible operators and mistakes must be anticipated as inevitable in the transport system. However, latent errors in traffic system must be reduced. All elements in the traffic system are inter related and responsibility for safety must be shared across all actors (Salmon et al. 2012).

However, the application of safe system approach to the study of traffic accident in Tanzania (as a developing country) is different compared to how could be applied in developed countries. There is a big difference between traffic system in high-income countries and traffic in low-income countries (WHO, 2013). The traffic pattern in low-income countries are more complex than those in high-income countries (Mohan, 2002). According to Mohan, the reasons for greater complexity in less motorised country urban areas are 1) large proportion of low-income people living in shanty towns, 2) a high proportional of non-motorised and two wheeler trips, 3) the presence of locally designed para-transit vehicles, 4) high density living and mixed land use and 5) severe limitations of land use. As a result, it is assumed that not all road safety strategies used in developed countries

can directly be applied in developing countries (Mohan, 2002; Mutto et al. 2002; Onabolu et al. 2008; WHO, 2009; Jacobs and Aeron-Thomas, 2000). One of the main argument is that, the composition of traffic and accident patterns in modern less-motorised countries are not only different from those prevailing today in the high income countries, but they are also substantially different from those prevailing in the high income countries at a comparable stage of development in the past (Mohan, 2002). Traffic system in low-income countries is an open system where no proper control and organisation compared to developed countries (based on differences in culture, level of economy, technology and political stability).

Therefore, traffic system in Tanzania is viewed as a large complex organisation and the management level of the system is the parliament or the government (Political entities), which are responsible for the very preliminary strategies, policies, legislation and infrastructure. This implies that the problem of road traffic accidents in Tanzania is not at a causation level, it is rather at a societal level. Hence, more focus on institutional set up, infrastructures, policies, community participation, strategies to sensitise politicians, or influencing political agenda, culture and professionalism, as well as exploring collective behavioural traits for specific road safety interventions

To suit Tanzanian context, a model of road safety by Swedish Road Administration (2008) is modified by integrating enforcement mechanism derived from Jørgensen and Abane`s model for road traffic accidents. This specifically intended to provide a strong base in understanding the system of traffic rules, laws, control and regulations exhibiting developing cities. In addition, it provides a basis for understanding the wider social cultural environment in relation to risk taking behaviour associated with traffic accidents and the operation of traffic system at a given place.

4.6 Field experience and limitations of the study

The following issues are associated to field experience and limitations of the study:

- In the survey, a complication concerning a definition who is a driver in Tanzania posed a limitation. Determining who is a driver in Tanzania was quite ambiguous. There are people who owned legal driving license without knowing how to drive and they identify

themselves as drivers, there are people who drive without a driving license and they are known as drivers, and there are people who possess driving licence but could not locate where they were trained. Therefore, the criteria used to target drivers (people owning valid driving license) was not so relevant in Tanzanian context. Instead we considered who ever drives, is a driver in Tanzanian context. This situation to a great extent has created some limitations in the analysis of traffic behaviour related to legal or trained drivers.

- Lack of prior research (studies) relating to 1) the importance of physical and socio- cultural environment on traffic safety in Tanzania. 2) Road user's attitudes, risk perceptions and risk taking behavior associated with road traffic accidents in Tanzania, has created some limitations on citing prior research (studies) which could be a base of literature review, or could help to lay a foundation for understanding the research problem investigated.
- Interviews were done in Swahili and the analysis was in English, this demanded more time during data analysis for interpretation and translation.
- There were more people in Urban and Semi urban areas willing to participate in the survey compared to rural areas, therefore a target of surveying 200 respondents in rural areas was not possible due to the nature of settlement pattern of the respondents (they were scattered), illiteracy to some respondents, and little exposure to traffic related issues. Illiterate respondents failed to read and to understand questions.
- Delimitation of urban and semi-urban areas was difficult, despite criteria being used in terms of population size, settlement pattern, traffic set-up, and distance from the centres. The association was a continuum, difficult to delimit. This was also supported by subjective judgements and local knowledge.

4.7 Ethical issues

Research formalities were done before data collection; this involved getting an introduction letter from the University (NTNU) and a permission letter from the Commission of Science and Technology in Tanzania. The Commission for Science and Technology (COSTECH) is a parastatal organization affiliated with the government of Tanzania. It is responsible in coordinating, recognizing and promoting research and technology development activities in the country

Informed consent: The informants were prior informed about the interview, participation was voluntary. The respondents involved into self-administered questionnaire were also informed at the first page of the questionnaire, which included the aims of the study.

Beneficence: Efforts were made to avoid any harm that an informant can experience during interview, this involved issues of not blaming the victims of road accidents especially those related to fatalities. The moment an informant expressed the loss of a relative, sympathy was made to console the informant, sometimes a little silence. Such questions were avoided. On the other hand, informants were free to express their feelings when wished to do so.

Respect for anonymity and confidentiality: The informants and respondents were informed and clarified in advance, about how their identities will be protected and provided assurances concerning security measures for the storage of any data collected in the course of the research. No names were written in questionnaires. Interviewed informants were informed that, they are entitled to reject particular forms of data-gathering. For instance, most of them refused to be recorded by tape-recorders and video. According to Hay (2010), anonymity refers to concealing the identities of participants in all documents resulting from the research; and Confidentiality is concerned with who has the right of access to the data provided by the participants.

CHAPTER FIVE

The spatial pattern and tendencies of risk perception, risk attitude, risk willingness and risk taking behaviour

5.0 Introduction

The specific objective of this chapter is to investigate and compare pattern and tendencies of risk perception, risk attitudes, risk willingness and risk taking behaviour of Tanzanian public and its social demographic characteristics (such as gender and age group) at different types of geographical areas (urban, semi-urban and rural areas).

The curiosity of this chapter is to find out; is there a significant difference in subjective risk judgement related to traffic accidents between people experiencing different levels of system risk in Tanzania? The hypothesis is based on the argument that, people living in areas experiencing different levels of system risk (such as urban, semi-urban and rural areas) can also perceive and behave differently on traffic related risk in Tanzania.

Demographic characteristics is also hypothesized to influence subjective risk judgement people make when they are asked to characterize and evaluate the danger of traffic related risk within their geographical areas.

To test the hypothesis by accommodating potential hypothesized confounding factors such as age group and gender, a stratified analysis was designed. Hosmer and Lemeshow (2000) suggested the use of stratified analysis to simplify the understanding of primary association of interest when the hypothesis is complex. Stratification is one way of simplifying reality so that the relationship between variables may be more clearly studied (Hosmer & Lemeshow, 2000). Hypothesis suggests a general relationship between two variables, stratification facilitate to a more detailed pattern and specific tendencies (Hosmer & Lemeshow, 2000).

Four stratified analysis are laid down to compare means of risk perception, risk attitude, risk willingness and risk taking behaviour at different levels of potential confounding factors; by

geographical area (urban, semi-urban and rural); by gender (male and female); and by age group (16-19years, 20-24years, 25-34years, 35-44years and 45+years).

- The first analysis is to examine whether geographical areas (context of urban, semi-urban and rural areas) can make a difference in risk perception, risk attitude, risk willingness and risk taking behaviour of road users in Tanzania.
- The second analysis is to examine whether gender division (males and females) within a specific area (either urban, semi-urban or rural) can make a difference in risk perception, risk attitude, risk willingness and risk taking behaviour of road users in Tanzania.
- The third analysis is to examine whether age- group within a specific area can make a difference in risk perception, risk attitude, risk willingness and risk taking behaviour of road users in Tanzania
- The fourth analysis is based on a three levels of stratification: geographical area, sex and age group. This intends specifically to check the significance of subgroups, which influence the general significance of the main variable.

In the first analysis, the multivariate analysis of variance (MANOVA) will examine the overall significance of the model and whether the independent variable has a significant overall main effect on the dependent measures. By obtaining the overall significant of the model by Wilks' lambda as a test statistic; type 1 error is supposedly reduced, and combined effect of the dependent variables and their intercorrelations among dependent variables will be revealed. In addition, the F-value, p-value, partial eta squared, descriptive statistics and post hoc test (scheffe) will be used to describe the pattern by comparing means of risk perception, risk attitude, risk willingness and risk taking behavior by geographical area, gender and age group. The stratified analysis two, three and four will be performed by ANOVA.

5.1 Data

Thirty single measure items in the questionnaire operationalised risk perception. The measure items related to characteristics and severity of a risk associated with traffic or other relevant hazards. Twenty-five single-measure items in the questionnaire operationalised risk attitude. These

were chosen responses of respondents to uncertainty that matters, driven by perception related to traffic. Forty-five single-measure items in the questionnaire operationalized risk willingness. This intended to determine the degree of risk willingness of respondents in relation to culture stimulus. Culture in this context refers to worldviews held by respondents, which can significantly stimulate their consent to take risk. In addition, 28 single-measure items operationalized risk-taking behavior in a questionnaire. These were respondents` tendencies to engage into traffic actions that have the potential to be harmful or dangerous.

Table 5.1. List of single measure items for risk perception, risk attitude, risk willingness and risk taking behavior

CATEGORY	ITEMS	SINGLE-MEASURE ITEMS
Risk Perception	**30**	*My car running off the road* *Head on collision* *Collision with another vehicle from behind* *Collision caused by changing driving lane* *Collision with a pedestrian* *The vehicle overturns in the roadway* *Collision with an animal* *A parking accident* *As a driver of a motor vehicle* *As a rider of a bicycle* *As a pedestrian* *As a passenger of a motor vehicle* *Other Sexual transmitted diseases* *Diahorrea* *Motor vehicles* *Infected food* *Vaccinations* *Alcohol* *Smoking* *Not enough exercise* *Unhealthy habits of eating* *Getting the cold* *Falling at the street* *Sexual assault* *Sexual harassment* *Epidemics/ Infections* *HIV/AIDS* *Malaria* *Drugs* *Poverty* *Handguns* *Knives* *Aviation* *Police razzia* *Vehicles* *Hunting* *Swimming* *Contraceptives* *Sports* *War* *Terrorism* *Stroma's* *Mass destruction* *Floods* *Fires*
Risk Attitude	**25**	*Ignoring Traffic regulations* *Traffic regulations Vs driving condition* *Careless drivers Vs careful drivers* *Careless pedestrian is to be blamed* *Severe sanctions to for driving too fast* *I can join my friends to unsafe driver* *No driving after alcohol consumption* *Severe sanctions for hitting pedestrians* *I have good knowledge of traffic rules* *Pedestrians make drivers powerless* *Risk at spare time* *As a rider of a bicycle* *As a pedestrian* *Increasing speed to overtake other cars* *Ignore red rights* *Traffic regulations are overcomplicated* *Decent driver should drive a bit faster* *Unsafe driver can drive if no alternative* *I will tell a driver if he/she drives fast* *A drunk driver cannot drive me home* *Driving after dark should be avoided* *Pedestrians should avoid cars* *Risk at work* *As a driver of motor vehicle* *As a passenger of a motor vehicle*
Risk Willingness	**45**	*Written word applies* *Written danger is serious* *I enjoy press debates* *I enjoy stories* *Oral request is serious* *Inner voice is good* *No inner voice no society* *Conviction simplify traffic* *I listen to peoples voice* *Horn implies signal* *Pictures says much more* *I act according to a picture* *I adopt behaviour I see* *I detect dangerous person* *I behave accordingly* *Writers are important in society* *Written request is serious* *I prefer written argument* *I remember what I`m told* *I listen to wrong and right* *I do what I'm told`* *I listen to my inner voice* *Sound orient impression* *I react to danger sound* *Few sounds safe traffic* *Signs of danger are serious* *Road signs are important* *Leaders should be examples* *Danger changes behaviour* *Behaviour Vs road signs* *I remember what I read* *I prefer reading laws* *What is said applies* *Said dangers are serious* *Corrections are serious* *I follow once inner voice* *I think of right or wrong* *I listen to music a lot* *I am aware about sounds* *Pictures give best stories* *I see and react* *Symbols work better* *life is learning* *I know peoples' behaviour* *I draw pictures to understand*
Risk Taking Behaviour	**28**	*Slow down pedestrian on road* *Due to pedestrian no night driving* *Slow down when it is dark* *Overtaking fast driving cars* *Drive above speed limit for a meeting* *Get distracted by external environment* *Keep on driving even if I am tired* *I drive long distance without seat belt* *Slow down due to danger signals* *Slow down due to slippery condition* *Driving after having several beers* *Go with a drunk driver* *Slowdown in children play areas* *Discus traffic safety with others* *Slow down pedestrian approaching* *Slow down in populated areas* *Increase speed in populated areas* *Ignore traffic regulations to meet time* *Keep short distance from front cars* *I create danger situation for being inattentive* *I drive without seat belt in shorter distances* *Slow down when a car behind is overtaking* *Slow down due to driving conditions* *Driving after having a beer* *Drive after alcohol consumption* *Reduce speed children are playing* *Tell a person to slow down if is driving fast* *Avoid walking on road when it is dark*

It was considered that, measures could be more reliable and valid if separate single-measure items will be computed to an index. The main purpose of data reduction was to condense multitudinous single-measure items down to the meaningful parts.

Hence, exploratory factor analysis was applied to identify the underlying measure items for risk perception, risk attitude, risk willingness and risk taking behavior to a pattern of correlation within the set of observed variables. All single measure items for risk perception , risk attitudes, risk willingness and risk taking behavior were subjected to a principal component analysis (PCA) with Varimax rotation and Kaizer normalization in order to determine their measures of internal consistency (dimensional structure). And Cronbach`s Alpha was applied as the model of internal consistency (Refer table 5.2). Cronbach`s Alpha is the most common used statistic for estimating a test`s reliability, and the results are supplemented by an average inter-item correlation (Coolican, 1999). Recommended alpha coefficients equal to or higher than 0.70 be used to assess whether a given set of items can be used to make up a scale (Nunnally 1978, Spector 1992).

Table 5.2. Rotated Component Matrix

Category	Measure items yielded to an index	Dimension value	Cronbach's alpha	Variable
Risk perception	Floods	.786	0.771	Geo-hazards
	Fires	.736		
	Land slides	.712		
	Aviation	.693	0.769	Man-made hazards
	Knives	.574		
	Weapons of mass destruction	.573		
	War	.564		
	Hunting	.564		
	Motor vehicles	.559		
	Police razzia	.501		
	Sexual harassment	.848	0.842	Sexual related hazards
	Sexual assault	.802		
	Epidemics infections	.630		
	HIV/AIDS	.598		
	Falling at the street	.584		
	Drugs	.538		
	Malaria	.796	0.739	Diseases related hazards
	Diahorrea	.705		
	Sexually transmitted diseases	.620		
	Alcohol	.801	0.724	Alcohol and unhealthy food related hazards
	Smoking	.708		
	Unhealthy habit of eating	.613		
	Infected food	.476		
Risk Attitude	Ignoring traffic regulations	.709	0.76	Attitude towards rule violation
	Ignoring red rights	.679		
	Join friends to unsafe driver	.664		
	Pedestrian is to be blamed	.649		
	Unsafe driver Vs safety threat	.603		
	Regulations are complicated	.578		
	Unsafe driver if no alternatives	.526		
	Overtaking fast driving cars	.473		
	No drive after drinking alcohol	.887	0.78	Drinking and driving
	Drunk driver can't drive me	.880		
Risk willingness	Written request is serious	.653	0.66	Written worldviews
	I remember best what I read	.619		
	Written danger is serious	.610		
	Written words always applies	.576		
	I read what the laws says I	.464		
	prefer written argument	.397		
	Road signs are important	.692	0.66	Signs and symbol worldviews
	Leaders should be examples	.684		
	Life and learning are connected	.658		
	Symbol is better than writing	.583		
Risk taking behaviour	Drive after having several beers	.874	0.949	Over speeding and risk driving
	Drive long without seat belt	.864		
	Drive after taking alcohol	.856		
	Go with drunk driver	.833		
	Overtaking fast driving car	.815		
	Drive after having a beer	.803		
	Driving when tired	.798		
	Drive shorter without seat belt	.780		
	Ignore traffic regulations	.777		
	Over speeding	.774		
	Keep short distance from cars	.741		
	Over speeding on densely areas	.737		
	Reduce speed due to road signs	.699		
	Slow down when it is dark	.736	0.701	Slow down due to pedestrian and darkness
	Slow down pedestrian crossing	.730		
	Slow down pedestrian on road	.699		
	Slowdown in populated areas	.693		
	Slow down driving condition	.831	0.771	Slow down due to danger condition
	Slow down due to slippery	.788		
	Slow down signal caution	.708		

Based on the rotated component matrix (refer table 5.2):

- 23 measure-items of risk perception yielded to an index of five (5) variable items; Geo-hazards, Man-made hazards, Sexual related hazards, and Disease related hazards, as well as Alcohol and unhealthy food related hazards.
- 10 measure-items of risk attitudes yielded to an index of two (2) variable items; Attitude towards rule violation and attitude towards drinking and driving.
- 10 measure-items of risk willingness yielded to an index of two (2) variable items; Willingness culture of ignoring written document and willingness culture of ignoring signs and symbols.
- 20 measure-items of risk taking behavior yielded to an index of three (3) variable items; Over speeding and risk driving, Slow down due to pedestrian and darkness and Slow down due to danger condition.

The overall composition of the indices revealed in the rotated component matrix for risk perception, risk attitude, risk willingness and risk taking behavior is satisfactory and reliable. With the use of similar questionnaire, Rundmo and Jørgensen (2009) also found that the reliability indices in terms of Cronbach's alpha values and mean corrected inter-item correlations were satisfactory in Norway, Russia, India, Ghana, Tanzania and Uganda. The majority of factors obtained satisfactory alpha-values around 0.70. In this analysis, the alpha value above 0.65 is rounded to 0.70 as a satisfactory index. The Cronbach's alpha is sensitive to the number of items included in a scale ((Nunnally, 1978). it is implicitly assumed that the average correlation of a set of items is an accurate estimate of the average correlation of all items that pertain to an observed construct of the results (Spector, 1992)

5.2 MANOVA.

- **Mean values for risk perception, risk attitude, risk willingness and risk taking behaviour by Geographical area (urban, semi-urban and rural)**

To examine the mean values for risk perception, risk attitude, risk willingness and risk taking behavior by MANOVA. In the general linear model of multivariate, the dimensions for risk perception, risk attitude, risk willingness and risk taking behavior were entered into analysis as dependent variables;

- Five dimensions for risk perception; 1) *Geo-hazards, 2) Man-made hazards, 3) Sexual related hazards, 4) Diseases related hazards, as well as 5) Alcohol and unhealthy food related hazards).*
- Two dimensions for risk attitudes 1) *Attitude towards rule violation and 2) attitude towards drinking and driving.*
- Two dimensions for risk willingness 1) *Willingness culture of ignoring written document and 2) willingness culture of ignoring signs and symbols.*
- And three dimensions for risk taking behavior *1) Over speeding and risk driving, 2) Slow down due to pedestrian and darkness and 3) Slow down due to danger condition*.

Whereas geographical area *(urban, semi-urban and rural)* was included as a fixed factor.

The results (refer table 5.3) revealed an overall significant difference of individuals` risk perception, risk attitude, risk willingness and risk taking behavior depending on a geographical area, Wilks` λ = .704, $p < .005$. The observed covariance matrices of the dependent variables (risk perception, risk attitude, risk willingness and risk taking behavior) are equal across the groups, Box`s Test of Equality of Covariance Matrices = .000. The means of a model set are normally distributed and with the same standard deviation, F=2.112, $p < .005$. The partial $\eta^2 = .16$, and the power to detect the effect is .964. Thus, hypothesis is confirmed. This generally indicate a strong overall significant effect of geographical areas in risk perception, risk attitudes, risk willingness and risk taking behavior of Tanzanian public on traffic.

The tests of between-subjects effects indicated that:

There was a significant effect in subjective risk judgement for “Man-made hazard” in risk perception, F value = 6.83, $p < .005$, when respondents were asked to characterise and evaluate

traffic related risk by their geographical areas (urban, semi-urban and rural). The post hoc comparison by using Scheffe indicates that, the mean scores for people perceiving "Manmade hazard" in urban areas ($\bar{X}$ = 16.07, SD = 6.47) were significantly different (p < .005) compared to people in rural areas ($\bar{X}$ = 11.69, SD = 4.16). Moreover, the mean scores for people perceiving "Man-made hazard" in semi-urban areas ($\bar{X}$ = 16.11, SD = 6.98) were significantly different (p < .05) compared to people in rural area ($\bar{X}$ = 11.69, SD = 4.16). However, the mean scores for people perceiving "Man-made hazard" did not reach a significant difference between urban and semi-urban areas.

- This can be interpreted that people living in urban and semi-urban areas perceive lower risk of man-made related dangers associated with road traffic accidents than those living in rural areas (i.e. high mean scores implies low risk perception)

There was a significant effect in subjective risk judgement for "Attitude towards rule violation" in risk attitude, F value = 12.21, p < .001, when respondents were asked to characterise and evaluate traffic related risk by their geographical areas (urban, semi-urban and rural). The post hoc comparison by using Scheffe indicates that, the mean scores for the attitude of people towards rule violation in urban areas ($\bar{X}$ = 30.07, SD = 6.76) was significantly different (p < .001) compared to people in rural areas ($\bar{X}$ = 22.77, SD = 10.96). Moreover, the mean scores for the attitude of people towards rule violation" in semi-urban areas ($\bar{X}$ = 30.89, SD = 6.65) was significantly different (p < .001) compared to people in rural area ($\bar{X}$ = 22.77, SD = 10.96). However, the mean scores for the "Attitude towards rule violation between urban and semi-urban areas did not reach a significant difference.

- This can be interpreted that the attitude towards rule violation is higher in rural areas than in urban and semi-urban areas. This could also mean that, people living in rural areas have positive attitude towards rule violation. (High $\bar{X}$ scores in attitude implicate negative attitude towards rule violation).

There was a significant effect in subjective risk judgement for "Over-speeding and risk driving" in risk taking behaviour, F value = 4.91, p < .05, when respondents were asked to characterise and evaluate the danger of traffic related risk by their geographical areas (urban, semi-urban and rural). The post hoc comparison by using Scheffe indicates that, the mean scores for the tendency of

people for over-speeding and risk driving" in urban areas ($\bar{X}$ = 50.20, SD = 14.08) was significantly different ($p < .05$) compared to people in rural area ($\bar{X}$ = 42.09, SD = 21.35). Moreover, the mean scores for the tendency of people for over-speeding and risk driving in semi-urban area ($\bar{X}$ = 53.67, SD = 14.30) was significantly different ($p < .05$) compared to people in rural areas ($\bar{X}$ = 42.09, SD = 21.35). However, the mean scores for "Over-speeding and risk driving" did not reach a significant difference between urban and semi-urban areas.

- This can be interpreted that the tendency of over speeding and risk driving is higher in rural areas and it indicates to be slightly lower in semi-urban and urban areas.

Table 5.3. Mean values for risk perception, risk attitudes, risk willingness and risk taking behavior by geographical area

Category	Dependent variables	Geographical area			F-Value	Post-hoc test (Scheffe)		
		Urban (N=75)	Semi-urban (N=36)	Rural (N=35)		Urban Vs S-urban	Urban Vs Rural	S-urban Vs Rural
Risk perception	Geo-hazards	$\overline{X}$ = 5.49	$\overline{X}$ =5.44	$\overline{X}$ =5.03	.29	Ns	Ns	Ns
	Man-made hazards	$\overline{X}$ =16.07 SD = 6.47	$\overline{X}$ =16.11 SD = 6.98	$\overline{X}$ =11.69 SD = 4.16	6.83**	Ns	p < .005	p < .05
	Sexual related hazards	$\overline{X}$ =11.83	$\overline{X}$ =11.39	$\overline{X}$ =9.71	1.35	Ns	Ns	Ns
	Diseases related hazards	$\overline{X}$ =6.09	$\overline{X}$ =5.58	$\overline{X}$ =5.31	.84	Ns	Ns	Ns
	Alcohol and unhealthy food related hazards	$\overline{X}$ =8.61	$\overline{X}$ =8.56	$\overline{X}$ =7.37	1.10	Ns	Ns	Ns
Risk attitude	Attitude towards rule violation	$\overline{X}$ = 30.07 SD = 6.76	$\overline{X}$ =30.89 SD = 6.65	$\overline{X}$ =22.77 SD = 10.96	12.21***	Ns	p < .001	p < .001
	Attitude towards drinking and driving	$\overline{X}$ =4.49	$\overline{X}$ =3.97	$\overline{X}$ =3.66	1.08	Ns	Ns	Ns
Risk willingness	Willingness culture of ignoring written documents	$\overline{X}$ =11.53	$\overline{X}$ =10.67	$\overline{X}$ =9.74	2.14	Ns	Ns	Ns
	Willingness culture of ignoring signs and symbols	$\overline{X}$ =5.71	$\overline{X}$ =5.39	$\overline{X}$ =6.31	1.12	Ns	Ns	Ns
Risk taking behaviour	Over speeding and risk driving	$\overline{X}$ =50.20 SD = 14.08	$\overline{X}$ =53.67 SD = 14.30	$\overline{X}$ =42.09 SD = 21.30	4.91*	Ns	p < .05	p < .05
	Slow down due to pedestrian and darkness	$\overline{X}$ =5.17	$\overline{X}$ =4.61	$\overline{X}$ =4.49	1.24	Ns	Ns	Ns
	Slow down due to danger condition	$\overline{X}$ =4.85	$\overline{X}$ =4.92	$\overline{X}$ =4.51	.24	Ns	Ns	Ns

Wilks` λ = .704, p < .005

*** P < .001 ** P < .005 * P < .05,
Ns = Not significant,
High $\overline{X}$ scores implicate low subjective judgement

High $\overline{X}$ scores in attitude implicate negative attitude towards rule violation.

The curiosity of this analysis was to find out; is there a significant difference in subjective risk judgement related to traffic accidents between people experiencing different levels of system risk such as urban, semi urban and rural areas in Tanzania?

The results generally revealed a strong overall significant effect of geographical areas in risk perception, risk attitudes, risk willingness and risk taking behavior of Tanzanian public on traffic.

- People living in urban and semi-urban areas perceive lower risk of man-made related dangers associated with road traffic accidents than those living in rural areas
- The attitude towards rule violation is higher in rural areas than in urban and semi-urban areas. This could also mean that, people living in rural areas have positive attitude towards rule violation.
- The tendency of over speeding and risk driving is higher in rural areas and it indicates to be slightly lower in semi-urban and urban areas.

In addition, there was no significant difference between urban and semi urban areas in terms of road users risk perception, risk attitude, risk willingness and risk taking behavior. The context of physical and social cultural environment in urban and semi-urban areas in Tanzania seems to be similar. This could also mean that; semi-urban traffic environment in Tanzania is more relating to urban traffic environment than rural traffic environment.

Perception related to manmade danger indicates to be low in urban and semi-urban areas and high in rural areas. This indicates some elements of risk prioritisation within spaces of urban and semi-urban context. Affeltranger and Thomasson (2005) argued that; when people are exposed to high number of different risk source, they may choose to prioritise more urgent affairs such as; food, stability and income rather than accident related risks. It could be that in urban and semi-urban areas in Tanzania, people experience high system risk such as several traffic accidents with minor injuries and minor property damages, while manmade dangers such as robbery and theft are more threatening to their life than traffic accidents. Therefore, more worries in urban and semi-urban areas are placed to manmade dangers than traffic accidents. Both cognitive and contextual aspects of worry support each other. For instance, Iversen & Rundmo (2004) suggest that, “to the extent that perceived risk is related to affectivity, it is the particular aspects of worry and concern that are influential”. The geographical interpretation of worry is subject to cultural adherence. In line with

Mary Douglas (1978), risk perception is not governed by personality traits, needs, preferences or properties of the risk objects. It is a socially, or culturally constructed aspects. Risk perception and the degree of worry or tolerance is a function of once cultural adherence at a place. The effect of affect in different contextual situation has not much explored by psychometric paradigm, nevertheless, human geography has not developed a strong research tradition on risk in general, but partly on environmental risk (geo-hazards) (Cutter, 1993). Reasons for that little are known about how spatial variation of perceived traffic related risk manifest itself as a function of socio-cultural construction of that particular place.

In addition, it might be that, urban communities in Tanzania are perceived as more modern societies (Mukandala, 2006), and it implies their social and economic transformations of society in the explanation of proneness to road traffic accidents and mitigation measures. This is also linked with increased mobility owned means of transport including demand for privately owned means of transport (Kimbi, 2005; Banyikwa, 2005). Therefore, the tendency of neglecting traffic risk in urban areas might imply the tolerance of development risk. Button (1993) argued that; traffic accidents, which occur in modernized societies, are an inevitable cost of the development process itself. In any case, the costs of traffic accidents are always outweighed by the benefits of increased motorization and, they can be tolerated and perceived as low risk (Button, 1993: Sagberg & Saetermo 1997: Thew, 2006).

On the other side, the explanation why people living in rural areas perceive higher risk in road traffic accident could be due to accidents tendencies and impact they normally experience. Their subjective risk judgments could relate to emotions such as worry of the impact they normally experience (Moen, 2008). For instance, urban and densely populated areas experience more minor accidents (minor crashes) and higher number injury rates while in rural and sparsely populated areas experience less total number of accidents and more severe accidents (fatal crashes and a higher death rate) (WHO, 2009; Eiksund, 2009). Due to severe impact of road accidents in rural areas, rural people may develop more worries than urban people may. Road accident related worry might be defined as the levels of concern that people experience when they think about the impact of being involved in an accident (Moen & Rundmo, 2006). Based on psychometric studies, worries correlate significantly to high-risk perception (Stafford et al. 2007; Gray et al. 2011).

Spatial variation of risk attitude and risk taking behaviour indicates a similar pattern and tendency experienced between urban and semi-urban vs rural areas. Attitude towards rule violation is more in rural areas than in urban and semi-urban areas, likewise risk taking behaviour particularly over speeding is more wide spread in rural than in urban or semi urban areas. These findings complement both; the findings of several studies in developed countries (Jørgensen, 2004; Jones et al., 2008; Nordfjaern et al., 2010) and also a theoretical perspective, arguing that, attitudes are strong predictors of behaviour. The cited studies indicate that differences in the frequencies of severe accidents, rule violation and willingness to take traffic risk between rural and urban areas are explained by differences in physical and social cultural environment such as road infrastructure, settlement pattern, traffic regulations, enforcement mechanism etc. For instance, Rakauskas et al. (2007) found that, people in rural areas were significantly less likely to put safety devices such as seat belts to use. Individuals in rural areas also reported driving under influence of alcohol intoxication than urban respondents. Jones et al. (2008) found that, roads invited to less speeding, such as urban roads with speed limit under 60mph, predicted reduced risk of causalities and risk taking behaviour such as over speeding and unnecessary overtaking.

The attitude towards traffic rule violation and risk taking behavior can probably be associated to traffic culture of a place. Traffic culture is socially constructed and varies from one place to another (Barzilai, 2003; Kim, 2001; Gray, 2006; Webb et al., 2010). Traffic culture in urban areas is composed by tight rules and regulations, well-defined traffic systems with road signs, markings and strong enforcements. In rural areas, traffic culture often lack systematic traffic regulations in their road systems, and the enforcement of such traffic systems is scant (Nantulya & Reich, 2002). A place tightened by well-defined traffic regulations and strong enforcement is expected to reduce the effect of people`s risk culture associated to traffic accidents. This might probably imply why people living in rural areas exhibit more risk culture of risk taking behavior associated with road traffic accidents in Tanzania.

On the other side, the differences on economic levels of geographical areas can also inform traffic culture of a place. Jones et al. (2008) revealed that; areas with a poorer economy indicated low safety motivation and people with low socio-economic status were found to be risk takers. These results can also inform why people living in rural areas exhibit high-risk attitudes and high

tendency of risky driving in Tanzania. Absolute poverty is more exerted and experienced in rural areas in Tanzania (URT, 2010; DFID Tanzania, 2010)

5.3 Distribution of sample composition (gender and age group) by geographical areas

In addition to variation due to geographical areas, a growing number of studies have demonstrated that, demographic characteristics could have important relations to risk perception, risk attitude, and risk taking behaviour (Nordfjaern, Jørgensen & Rundmo, 2010; Eiksund, 2009). Age group and gender have been a consistent predictor of differences in risk perception, risk attitude and risk taking behaviour in a number of studies (e.g. Iversen & Rundmo, 2004; Oltedal & Rundmo, 2006; Eiksund, 2009). These studies have found that males in general and younger males in particular, have less favourable attitude to driving, and higher behavioural tendencies to take risks in traffic than females. Other studies found that attitude to driving and driving behaviour are ideal among older individuals compared to younger individuals (Iversen & Rundmo, 2004). On contrary, Eiksund (2009) found that older adolescent reported more risk taking behaviour than younger adolescent does.

This is likely that, demographic characteristics and personality variables are important predictors of behavior. Nordfjaern et al. (2010) argued that, very few studies have investigated differences in these relations in rural, semi-urban and urban areas. Hence, an important sub aim of this analysis is to investigate whether age group and gender can make significant differences in risk perception, risk attitude, risk willingness and risk taking behavior in these geographical area types in Tanzania.

5.4 ANOVA (by geographical area and gender)

- **Mean values for risk perception, risk attitude, risk willingness and risk taking behaviour by Geographical area and gender**

A one-way between subjects ANOVA was conducted to compare the effect of gender for risk perception, risk attitude, risk willingness and risk taking behaviour by Geographical area. This stratified analysis was to adjust for gender differences in the geographical areas. This aimed to examine if gender (male and female) is controlled within a specific area (urban, semi-urban and rural) can make a difference in risk perception, risk attitude, risk willingness and risk taking behaviour in Tanzania.

The file was split into geographical areas (urban, semi-urban and rural areas) and sex (males and females). One-way analysis of variance (ANOVA) was processed. Results (refer table 31) indicate that;

There was a significant effect for "Sex and drugs related danger" in risk perception for the males F value (2,358) = 5.452, p = .005, when gender is adjusted within the geographical areas (urban, semi-urban and rural). The post hoc comparison by Scheffe indicates that, the mean scores for the males living in urban areas in perceiving "Sex and drugs related danger" ($\bar{X}$ = 12.4, SD = 6.6) was significantly different (P = .043) compared to males in semi-urban area ($\bar{X}$ = 10.6, SD = 6.2) when gender was adjusted by geographical areas. Moreover, the mean scores for the males living in urban areas in perceiving "Sex and drugs related danger ($\bar{X}$ = 12.4, SD = 6.6) was significantly different (P = .019) compared to males rural area ($\bar{X}$ = 9.9, SD = 5.4) when gender was adjusted by geographical areas. However, the mean scores for "Sex and drugs related danger" for the males did not reach a significant difference between semi-urban and rural areas, when gender was adjusted by geographical areas.

- This can be interpreted that, males living in urban areas perceive sex and drugs related dangers lower than males living in semi-urban and rural areas.

There was a significant effect for "Attitude towards rule violation" in risk attitude for the males F value (2,342) = 4.358, p = .014, when gender is adjusted within the geographical areas (urban, semi-urban and rural). The post hoc comparison by using Scheffe indicates that, the mean scores

for the male`s attitude towards rule violation in urban area ( $\bar{X}$ = 31.0, SD = 5.7) was significantly different (P = .065) compared to males in rural area ( $\bar{X}$ = 29.0, SD = 7.0) when gender was adjusted by the geographical areas. Moreover, the mean scores for the male`s attitude towards rule violation in semi-urban area ($\bar{X}$ = 31.8, SD = 5.7) was significantly different (P = .015) compared to males living in rural area ($\bar{X}$ = 29.0, SD = 7.0) when gender was adjusted by the geographical areas. However, the mean scores for "Attitude towards rule violation" for the males did not reach a significant difference between urban and semi-urban areas.

- This can be interpreted that the attitude towards rule violation for the males living in rural areas is higher than males living in urban and semi-urban areas.

Dimensions for risk willingness and risk taking behaviour become not significant if gender (males and females) is adjusted within the geographical areas (urban, semi-urban and rural areas)

A peculiar finding is that, females appeared none significant in all dimensions for risk perception, risk attitude, risk willingness, and risk taking behaviour, when gender (males and females) is adjusted within geographical areas (urban, semi-urban and rural areas).

Table 5.4.Mean values for risk perception, risk attitude, risk willingness and risk taking behaviour by Geographical area and gender

	Variable	Gender	F-value	Area	Descriptive Statistics			Post hoc test (Scheffe)
					N	Mean	Std.-dev	
Risk perception	Sex and drugs related danger	Males	5.452**	Urban Semi-urban Rural	185 108 68	12.4 10.6 9.9	6.6 6.2 5.4	Urban – rural = .019 Urban – semi-urban = .043
		Females	Ns	-	-	-	-	-
Risk attitude	Attitude towards rule violation	Males	4.358*	Urban Semi-urban Rural	183 100 62	31.0 31.8 29.0	5.7 5.7 7.0	Urban – rural = .065 Semi-urban – rural = .015
		Females	Ns	-	-	-	-	-
Risk willingness	-	-	-	-	-	-	-	-
Risk taking behaviour	-	-	-	-	-	-	-	-

NB Only significant variable items are shown in this table

*** P < .001 ** P < .005 * P < .05,
Ns = Not significant,
High $\overline{X}$ scores implicate low subjective judgment

High $\overline{X}$ scores implicate negative attitude towards traffic rule violation.

The curiosity of this analysis was to examine whether gender division (males and females) within a specific area (either urban, semi-urban or rural) can make a difference in risk perception, risk attitude, risk willingness and risk taking behaviour of road users in Tanzania.

- Males living in urban areas perceive sex and drugs related dangers lower than males living in semi-urban and rural areas.
- The attitude towards rule violation for the males living in rural areas is higher than males living in urban and semi-urban areas.
- Dimensions for risk willingness and risk taking behaviour become not significant if gender (males and females) is adjusted within the geographical areas (urban, semi-urban and rural areas)
- Females appeared none significant in all dimensions for risk perception, risk attitude, risk willingness, and risk taking behaviour, when gender (males and females) is adjusted within geographical areas (urban, semi-urban and rural areas).

The results are partly congruent and partly contrary to the study of an investigation of driver attitude and driver behaviour in rural and urban areas in Norway by Nordfjærn, Jørgensen and

Rundmo (2010). In their analysis, Nordfjærn et al. (2010) found that; the overall main effect of geographical area reached significance. Differences in driver attitudes by rural, peri-urban and urban areas failed to reach significance. Differences in driver behaviour were significant for the dimension relating to not using seatbelt. Drivers in rural areas were significantly less likely to use seat belt than those in urban areas, also drivers in rural areas were less likely to reduce speed due to difficult condition compared drivers in urban areas. When gender, age group, education and geographical areas were included as fixed factors, there was a strong overall main effect, but the interaction effect between gender and geographical area by chi-square failed to reach significance. This is contrary to the findings of this study. In this study, the overall main effect of geographical area and gender reached a significant. The attitude towards rule violation was found to be higher for males living in rural areas than those living in urban and semi-urban areas.

Even though Nordfjærn et al. (2010) did not find a significant difference in driver attitudes by rural, peri-urban and urban areas when gender was taken into control. In this study also females appeared none significant in all dimensions for risk perception, risk attitude, risk willingness, and risk taking behaviour, when gender (males and females) is adjusted within geographical areas (urban, semi-urban and rural areas). The explanations for male significant differences in Tanzania could also relate to the aspects of social cultural environment in Tanzania. Traffic related activities are socially constructed and gendered. The cultural norms regarding gender stereotypes about traffic related activities is characterized as masculine activities. Commercial driving and travelling activities in Tanzania are more masculine relevance than feminine (Banyikwa, 2005). This could also mean that, more males are expected to participate on traffic related issues than females in Tanzania. Police report (2010) indicates that, only 30% of people driving in Tanzania are women, only 2% of commercial drivers are women, 35% of drivers driving private cars are women and only 34% of the registered driving licence in Tanzania are women. Statistically it means that, women drivers constitute approximately 1/3 of drivers in Tanzania.

5.5 ANOVA (by geographical area and age group)

- **Mean values for risk perception, risk attitude, risk willingness and risk taking behaviour by geographical area and age group.**

A one-way between subjects ANOVA was conducted to compare the effect of age group for risk perception, risk attitude, risk willingness and risk taking behaviour by Geographical area (urban, semi-urban and rural). This stratified analysis was to adjust for the age group differences in the geographical areas. This aimed to examine if age group (16-19years, 20-24years, 25-34years, 35-44years and 45+years) is controlled within a specific area (urban, semi-urban and rural) can make a difference in risk perception, risk attitude, risk willingness and risk taking behaviour of road users in Tanzania.

The file was split into geographical area (urban, semi-urban and rural areas) and age group (16-19years, 20-24years, 25-34years, 35-44years and 45+years). One-way analysis of variance (ANOVA) was processed. Results (refer table 5.5) indicate that;

There was a significant effect for "Unhealthy related habit" in risk perception for the age group 16-19 years, F value (2,68) = 3.714, p = .029, when the age groups are adjusted within the geographical areas (urban, semi-urban and rural). The post hoc comparison by using Scheffe indicates that, the mean scores for "Unhealthy related habit" for the age group 16-19 years in urban area ($\bar{X}$ = 9.7, SD = 5.1) was significantly different (P = .047) compared with the same age in in semi-urban area ($\bar{X}$ = 6.6, SD = 3.0), when the age groups are adjusted by geographical areas. However, the mean scores for "Unhealthy related habit" for the age group 16-19 did not reach a significant difference between urban vs rural and semi-urban vs rural areas, when the age group was adjusted by geographical areas.

- This can be interpreted that the perception of unhealthy related habit for the age group 16-19 years in urban area is lower than in semi-urban area.

There was a significant effect for the "Attitude towards rule violation" in risk attitude for the age group 16-19 years, F value (2, 68) = 6.722, p = .002, when the age groups are adjusted within the geographical areas (urban, semi-urban and rural). The post hoc comparison by using Scheffe indicates that, the mean scores for the "Attitude towards rule violation" for the age group 16-19 years in urban area ($\bar{X}$ = 32.1, SD = 5.4) was significantly different (P = .026) compared with the

same age group in rural area ($\bar{X}$ = 27.5, SD = 6.9), when the age groups are adjusted by the geographical areas. Moreover the mean scores for the "Attitude towards rule violation by the age group 16-19 years in semi-urban area ($\bar{X}$ = 33.5, SD = 3.7) was significantly different (P = .002) compared with the same age group in rural area ($\bar{X}$ = 27.5, SD = 6.9), when the age groups are adjusted by the geographical areas. However, the mean scores for the "Attitude towards rule violation" for the age group 16-19 years did not reach a significant difference between urban vs semi-urban areas, when the age groups are adjusted by the geographical areas.

- This can be interpreted that the attitude towards rule violation for the age group 16-19years in rural area is higher than in urban and semi-urban areas.

There was a significant effect for the "Attitude towards rule violation" in risk attitude for the age group 20-24 years, F value (2, 92) = 4.390, p = .015, when the age groups are adjusted within the geographical areas (urban, semi-urban and rural). The post hoc comparison by using Scheffe indicates that, the mean scores for the "Attitude towards rule violation" for the age group 20-24 years in urban area ($\bar{X}$ = 31.8, SD = 4.1) was significantly different (P = .019) compared with the same age in in rural area ($\bar{X}$ = 27.5, SD = 8.0), when the age groups are adjusted by the geographical areas. However, the mean scores for the "Attitude towards rule violation" for the age group 20-24 years did not reach a significant difference between urban vs semi-urban and semi-urban vs rural areas.

- This can be interpreted that the attitude towards rule violation for the age group 20-24years in rural area is higher than in urban area.

There was a significant effect for the "Speeding and risky driving" in risk taking behaviour for the age group 25-34 years F value (2, 115) = 4.286, p = .016 when the age groups are adjusted within the geographical areas (urban, semi-urban and rural). The post hoc comparison by using Scheffe indicates that, the mean scores for the "Speeding and risky driving" for age group 25-34years in urban area ($\bar{X}$ = 47.9, SD = 14.9) was significantly different (P = .020) compared with the same age in rural area ($\bar{X}$ = 58.5, SD = 11.1), when the age groups are adjusted by the geographical areas. However, the mean scores for the "Speeding and risky driving" for the age group 25-34 years did not reach a significant difference between urban vs semi-urban and semi-urban vs rural areas when the age group was adjusted by geographical areas.

- This can be interpreted that the tendency of speeding and risky driving for the age group 25-34 years is lower in rural area than in urban area

There was a significant effect for the "Attitude towards rule violation" in risk attitude for the age group 35-44 years, F value (2, 81) = 4.972, p = .009, when the age groups are adjusted within the geographical areas (urban, semi-urban and rural). The post hoc comparison by using Scheffe indicates that, the mean scores for the "Attitude towards rule violation" for the age group 35-44 years in urban area ($\bar{X}$ = 31.2, SD = 5.0) was significantly different (P = .044) compared with the same age in rural area ($\bar{X}$ = 26.5, SD = 9.2), when the age groups are adjusted by the geographical areas. Moreover the mean scores for the "Attitude towards rule violation for the age group 35-44 years in semi-urban area ($\bar{X}$ = 32.0, SD = 5.2) was significantly different (P = .011) compared with the same age in rural area ($\bar{X}$ = 26.5, SD = 9.2), when age groups are adjusted by the geographical areas. However, the mean scores for the "Attitude towards rule violation" for the age group 16-19 years did not reach a significant difference between urban vs semi-urban areas, when age group was adjusted by the geographical areas

- This can be interpreted that the attitude towards rule violation for the age group 35-44years in rural area is higher than in urban and semi-urban areas.

There was a significant effect for the "About signs and symbols" in risk willingness for the age group 35-44 years F value (2, 91) = 3.345, p = .040 when the age groups are adjusted within the geographical areas (urban, semi-urban and rural). The post hoc comparison by using Scheffe indicates that, the mean scores for the "About signs and symbols" for age group 35-44years in semi-urban area ($\bar{X}$ = 5.5, SD = 2.4) was significantly different (P = .047) compared with the same age in rural area ($\bar{X}$ = 7.2, SD = 3.3), when the age groups are adjusted by the geographical areas. However, the mean scores for the "About signs and symbols" for the age group 35-44 years did not reach a significant difference between urban vs rural and semi-urban vs urban areas when the age groups are adjusted by geographical areas.

- This can be interpreted that risk willingness regarding signs and symbols for age group 35-44years in rural area is higher than in semi urban area.

There was a significant effect for the "Speed and risk driving" in risk taking behaviour for the age group 35-44 years F value (2, 39) = 7.060, p = .002 when the age groups are adjusted within the geographical areas (urban, semi-urban and rural). The post hoc comparison by using Scheffe indicates that, the mean scores for the "Speed and risk driving" for the age group 35-44years in semi-urban area ($\bar{X}$ = 51.2, SD = 14.0) was significantly different (P = .002) compares with the same age in rural area ($\bar{X}$ = 38.0, SD = 17.7), when the age groups are adjusted by the geographical areas. However, the mean scores for the "Speed and risk driving" for the age group 35-44 years did not reach a significant difference between urban vs rural and semi-urban vs urban areas when the age groups are adjusted by geographical areas.

- This can be interpreted that the tendency of speeding and risky driving for the age group 35-44 years is higher in rural area than in urban area

There was a significant effect for the "Attitude towards rule violation" in risk attitude for the age group 45+years, F value (2, 41) = 14.89.4, p = .000, when the age groups are adjusted within the geographical areas (urban, semi-urban and rural). The post hoc comparison by using Scheffe indicates that, the mean scores for the "Attitude towards rule violation" for the age group 45+in urban area ($\bar{X}$ = 32.3, SD = 5.4) was significantly different (P = .000) compared with the same age group in rural area ($\bar{X}$ = 19.4, SD = 9.7), when the age groups are adjusted by the geographical areas. Moreover the mean scores for the "Attitude towards rule violation by the age group 45+ years in semi-urban area ($\bar{X}$ = 31.2, SD = 5.0) was significantly different (P = .000) compared with the same age group in rural area ($\bar{X}$ = 19.4, SD = 9.7), when the age group are adjusted by the geographical areas. However, the mean scores for the "Attitude towards rule violation" by the age group 45+ years did not reach a significant difference between urban vs semi-urban areas, when the age groups are adjusted by the geographical areas.

- This can be interpreted that the attitude towards rule violation for the age group 45+ years in rural area is higher than in urban and semi-urban areas.

There was a significant effect for the "Slow down due to pedestrian and darkness" in risk taking behaviour for the age group 45+ years F value (2, 39) = 3.922, p = .028 when the age groups are adjusted within the geographical areas (urban, semi-urban and rural). The post hoc comparison by using Scheffe indicates that, the mean scores for the "Slow down due to pedestrian and darkness"

for the age group 45+ in semi-urban area ($\bar{X}$ = 3.8, SD = 1.8) was significantly different (P = .028) compared with the same age in rural area ($\bar{X}$ = 5.9, SD = 2.1), when the age groups are adjusted by the geographical areas. However, the mean scores for the "Slow down due to pedestrian and darkness" by the age group 45+ years did not reach a significant difference between urban vs rural and semi-urban vs urban areas when the age groups are adjusted by geographical areas.

- This can be interpreted that the tendency of slowing down due to pedestrian and darkness for the age group 45+ in semi urban area is higher than in rural areas.

There was a significant effect for the "Slow down due to danger condition" in risk taking behaviour for the age group 45+ years F value (2, 38) = 4.591, p = .016 when the age groups are adjusted within the geographical areas (urban, semi-urban and rural). The post hoc comparison by using Scheffe indicates that, the mean scores for the "Slow down due to danger condition" for the age group 45+ years in urban area ($\bar{X}$ = 4.0, SD = 1.4) was significantly different (P = .047) compared with the same group in rural area ($\bar{X}$ = 6.4, SD = 3.6), when the age groups are adjusted by the geographical areas. Moreover, the mean scores for the "Slow down due to danger condition" for the age group 45+ in semi-urban area ($\bar{X}$ = 4.1, SD = 1.5) was significantly different (P = .040) compared with the same age group in rural area ($\bar{X}$ = 6.4, SD = 3.6), when the age groups are adjusted by the geographical areas. However, the mean scores for the "Slow down due to danger condition" by the age group 45+ years did not reach a significant difference between semi-urban vs urban areas when the age groups are adjusted by the geographical areas.

- This can be interpreted that the tendency of slowing down due to danger condition for the age group 45+ in rural area is lower than in urban and semi urban areas.

Table 5.5. Mean values for risk perception, risk attitude, risk culture and risk taking behavior by Geographical Area and Age group

	Age group	Variable	F-value	Area	Descriptive Statistics			Post hoc test
					N	Mean	Std Dev.	
Risk perception	16-19years	Un healthy related habit	3.174*	Urban Semi-urban Rural	26 31 14	9.7 6.6 9.4	5.1 3.0 6.1	Urban – semi urban = .047
Risk attitude	16-19years	Rule violation	6.722**	Urban Semi-urban Rural	27 30 14	32.1 33.5 27.5	5.4 3.7 6.9	Urban – rural =.026 Semi-urban - rural = 002
	20-24years	Rule violation	4.390*	Urban Semi-urban Rural	63 17 15	31.8 31.9 27.5	4.1 5.9 8.0	Urban – rural =.019
	35-44years	Rule violation	4.972**	Urban Semi-urban Rural	31 36 17	31.2 32.0 26.5	5.0 5.2 9.2	Urban – rural =.044 Semi-urban – rural =.011
	45+ years	Rule violation	14.894***	Urban Semi-urban Rural	11 17 16	32.3 31.2 19.4	5.4 5.0 9.7	Urban – rural =.000 Semi-urban – rural =.000
Risk willingness	20-24years	About written document	3.553*	Urban Semi-urban Rural	68 17 15	11.9 9.8 9.9	3.4 3.4 4.6	Ns
	35-44years	About signs and symbols	3.345*	Urban Semi-urban Rural	33 43 18	5.7 5.5 7.2	1.9 2.4 3.3	Semi-urban – rural =.047
Risk taking behaviour	16-19years	Speeding & risk driving	5.902*	Urban Semi-urban Rural	7 0 3	56.00 - 39.33	11.3 - 3.8	Ns
	25-34years	Speeding & risk driving	4.286*	Urban Semi-urban Rural	63 37 18	47.9 52.2 58.5	14.9 13.5 11.1	Urban – rural = .020
	35-44years	Speeding & risk driving	7.060**	Urban Semi-urban Rural	14 20 8	51.2 57.7 38.0	14.0 8.6 17.7	Semi-urban – rural =.002
	45+ years	Speeding & risk driving	3.380*	Urban Semi-urban Rural	10 13 10	53.1 54.2 39.0	15.7 10.7 18.8	Ns
		Slow due to ped. & darkness	3.922*	Urban Semi-urban Rural	13 15 14	4.3 3.8 5.9	2.3 1.8 2.1	Semi-urban – rural =.035
		Slow due to danger condition	4.591*	Urban Semi-urban Rural	12 15 14	4.0 4.1 6.4	1.4 1.5 3.6	Urban – rural =.047 Semi-.urban – rural =.040

NB Only significant variable items are shown in this table.

*** P < .001 ** P < .005 * P < .05,
Ns = Not significant,
High $\overline{X}$ scores implicate low subjective judgment

High $\overline{X}$ scores implicate negative attitude towards traffic rule violation

The curiosity of this analysis was to examine whether age- group within a specific area can make a difference in risk perception, risk attitude, risk willingness and risk taking behaviour of road users in Tanzania. The results revealed that;

- The attitude towards rule violation for the age group 16-19years in rural area is higher than in urban and semi-urban areas.
- The attitude towards rule violation for the age group 20-24years in rural area is higher than in urban area.
- The tendency of speeding and risky driving for the age group 25-34 years is lower in rural area than in urban area
- The attitude towards rule violation for the age group 35-44years in rural area is higher than in urban and semi-urban areas.
- Risk willingness regarding signs and symbols for age group 35-44years in rural area is higher than in semi urban area.
- The tendency of speeding and risky driving for the age group 35-44 years is higher in rural area than in urban area
- The attitude towards rule violation for the age group 45+ years in rural area is higher than in urban and semi-urban areas.
- The tendency of slowing down due to pedestrian and darkness for the age group 45+ in semi urban area is higher than in rural areas.
- The tendency of slowing down due to danger condition for the age group 45+ in rural area is lower than in urban and semi urban areas.

By observing the pattern of the results in table 5.5. Almost all the age groups except the age group 25-34 years (which was not significant) living in rural areas posit positive attitude towards rule violation. One possibility of interpreting this finding is that, it might be that, majority of people living in rural areas in Tanzania have lower education than those living in urban and semi urban areas, that can probably explain such a pattern. Education has a significant influence to attitude and safe behaviour (Hoseth & Rundmo, 2005). Nordfjærn & Rundmo (2009) argued that, people with high education could be more likely to live in safe areas and to drive safe cars and most likely could be found in urban areas. Education statistics in Tanzania indicate high illiteracy level in rural areas (Ministry of Education, 2007)

This finding is also partly congruent to the study done by Kmet and Macarthur (2006) cited in Nordfjærn et al. (2010). According to Nordfjærn et al., Kmet and Macarthur investigated

differences in hospitalisation rates among adolescent across rural and urban settlement in Canada. Their findings revealed that, young people in rural communities had five times the risk of dying due to traffic accidents and three times the risk of being hospitalised due to road traffic accidents. The authors (also cited in Nordfjærn et al. (2010)) partially attributed these differences in road traffic risk to more risk attitudes and risky driving behaviour contained by young people in rural areas.

5.6 ANOVA (by geographical area, gender and age group)

- **Mean values for risk perception, risk attitude, risk willingness and risk taking behaviour by geographical area, gender and Age group**

A one-way between subjects ANOVA was conducted to compare means for risk perception, risk attitude, risk willingness and risk taking behaviour based on a three levels of stratification: geographical area (urban, semi-urban and rural areas), age-group (16-19years, 20-24years, 25-34years, 35-44years and 45+years) and gender (males and females). This analysis intends specifically to check the significance of subgroups, which influence the general significance of the main variable.

The file was split by organising the output by gender and age group while geographical area as a fixed factor. One-way analysis of variance (ANOVA) was processed. Results (refer table 5.6) indicate that;

There is no significant effect of subgroups influencing risk perception when the sample of the population is analysed based on three levels of stratification: (by geographical area, sex and age group). Most of the subgroups in risk perception were nearly significant, perhaps could have been significant if with a bigger sample size.

There was a significant effect for the "Attitude towards rule violation" in risk attitude for the females aged between 16-19, F value (2, 33) = 4.267, p = .022, when the age groups and gender are adjusted within the geographical areas (urban, semi-urban and rural). The post hoc comparison by using Scheffe indicates that, the mean scores for the "Attitude towards rule violation" for the female between 16-19 years in urban area ($\bar{X}$ = 33.7, SD = 4.3) was significantly different (P =

.024) compared with females of the same age in rural area ($\bar{X}$ = 26.3, SD = 60), when age groups and gender were adjusted by the geographical areas. Moreover the mean scores for the "Attitude towards rule violation" for the females aged between 16-19 years in semi-urban area ($\bar{X}$ = 33.2, SD = 3.4) was significantly different (P = .044) compared with females of the same age in rural area ($\bar{X}$ = 26.3, SD = 6.0), when age groups and gender were adjusted by the geographical areas. However, the mean scores for the "Attitude towards rule violation" for the females aged between 16-19 years did not reach a significant difference between urban vs semi-urban areas, when age groups and gender were adjusted by the geographical areas.

- This can be interpreted that the attitude towards rule violations by females aged between 16-19 years in rural area is higher than females of the same age in urban and semi-urban areas.

There was a significant effect for the "Attitude towards rule violation" in risk attitude for the males aged between 16-19, F value (2, 32) = 4.836, p = .015, when the age group and gender are adjusted within the geographical areas (urban, semi-urban and rural). The post hoc comparison by using Scheffe indicates that, the mean scores for the "Attitude towards rule violation" for the males between 16-19 years in semi-urban area ($\bar{X}$ = 33.7, SD = 4.0) was significantly different (P = .038) compared with males of the same age in rural area ($\bar{X}$ = 27.8, SD = 7.3), when age groups and gender were adjusted by the geographical areas. However, the mean scores for the "Attitude towards rule violation" for the males aged between 16-19 years did not reach a significant difference between urban vs rural and urban vs semi-urban, when age group and gender were adjusted by the geographical areas.

- This can be interpreted that the attitude towards rule violations by males aged between 16-19 years in rural area is higher than males of the same age in semi-urban areas.

Table 5.6. Mean Values for risk perception, risk attitude, risk willingness and risk taking behaviour by Geographical area, Age group and Gender

	Variables	Age-Group	Gender	F-value	Geographical area	Descriptive statistics			Post-hoc test (Scheffe)
						N	*Mean*	*Std-Deviation*	
Risk perception	-	-	-	*NS*	-	-	-	-	NS
Risk attitudes	**Attitude towards rule violation**	16-19 years	*Females*	*4.267* *	Urban Semi-urban Rural	*20* *13* *3*	*33.7* *33.2* *26.3*	*4.3* *3.4* *6.0*	Urban-Rural .024 S.urban-Rural .044
		16-19 years	*Males*	*4.836* *	*Urban* *Semi-urban* *Rural*	*7* *17* *11*	*27.7* *33.7* *27.8*	*6.1* *4.0* *7.3*	*S.urban-Rural .038*
Risk willingness	***About written documents***	*20-24 years*	*Females*	*4.974**	*Urban* *Semi-urban* *Rural*	*31* *9* *-*	*12.5* *9.4* *-*	*3.5* *3.8* *-*	*NS*
	About signs and symbols	*35-44 years*	*Females*	*3.729**	*Urban* *Semi-urban* *Rural*	*12* *18* *2*	*6.1* *5.0* *8.5*	*2.3* *1.6* *0.7*	*NS*
Risk Taking Behaviour	***Speeding and risk driving***	*16-19 years*	*Females*	*1058.000***	*Urban* *Semi-urban* *Rural*	*2* *0* *2*	*64.5* *-* *41.5*	*0.7* *-* *0.7*	*NS*
		25-34 years	*Males*	*4.180**	*Urban* *Semi-urban* *Rural*	*57* *30* *12*	*47.7* *52.1* *60.0*	*14.5* *13.6* *10.7*	*Urban-Rural .023*
		35-44 years	*Females*	*4.391**	*Urban* *Semi-urban* *Rural*	*5* *7* *1*	*50.2* *61.7* *49.0*	*10.3* *3.6* *-*	*NS*
	Slow down due to danger	*20-24 years*	*Females*	*132.250***	*Urban* *Semi-urban* *Rural*	*3* *1* *-*	*4.3* *12.0* *-*	*0.6* *-* *-*	*NS*
		25-34 years	*Males*	*3.037**	*Urban* *Semi-urban* *Rural*	*61* *33* *14*	*5.2* *4.2* *3.7*	*2.8* *2.0* *1.5*	*NS*
	Slowdown due to pedestrian and darkness	*25-34 years*	*Males*	*3.166**	*Urban* *Semi-urban* *Rural*	*70* *33* *14*	*5.4* *4.4* *3.9*	*2.5* *2.7* *1.4*	*NS*

NB Only significant variable items are shown in this table.

High $\bar{X}$ scores implicate low subjective risk judgment
*** P < .001 ** P < .005 * P < .05,
Ns = Not significant,
High $\bar{X}$ scores implicate low subjective judgment

High $\bar{X}$ scores implicate positive attitude towards traffic rule violation

The analysis based on a three levels of stratification: geographical area, gender and age group, intended specifically to check the significance of subgroups, which influence the general significance of the main variable. The general overview of the results, portray similar pattern and tendency compared to results in analysis two and three. What is interesting is that, when the geographical areas were controlled by gender, females were seen not significant, and when the

analysis is based on three levels of stratification (geographical areas, gender and age group) gender difference especially females groups are eventually becoming significant.

This finding resembles to Simpsons Paradox. It is a paradox in probability and statistics, in which a trend appears in different groups of data but disappears or reverses when these groups are combined. The result is particularly confounding when frequency data is unduly given causal interpretation. By comparing Simpsons paradox about causal interpretation, the result in this case could be interpreted that, the relationship between gender and age-group in risk attitude, risk willingness and risk taking behaviour is stronger than between gender and type of geographical areas (urban, semi-urban and rural).

To some extent, this observation is similar to the study done by Nordfjærn, Jørgensen and Rundmo (2010) about driver attitudes and behaviour in rural, peri-urban and urban areas in Norway. Age, gender and education were controlled as an additional aim to investigate the relations between demographics, personality variables, driver attitudes and behaviour in the complete sample and across the different geographical areas. The results indicated that, differences in attitude and self-reported behaviour were significant due to type of geographical areas. However, gender, age and education caused stronger differences than type of geographical area in attitudes to driving and driver behaviour.

Indeed, results of the analysis based on a three levels of stratification: geographical area, gender and age group could also imply that; demographic characteristics (gender and age group) and their composition in urban, semi-urban and rural areas are more important for identifying differences in risk attitude, risk willingness and risk taking behaviour associated with road traffic accidents in Tanzania.

5.7 Summary

The specific objective of the chapter was;

- To examine whether geographical areas (context of urban, semi-urban and rural areas) can make a difference in risk perception, risk attitude, risk willingness and risk taking behaviour of road users in Tanzania.

- To examine whether gender division (males and females) within a specific area (either urban, semi-urban or rural) can make a difference in risk perception, risk attitude, risk willingness and risk taking behaviour of road users in Tanzania.
- To examine whether age- group within a specific area can make a difference in risk perception, risk attitude, risk willingness and risk taking behaviour of road users in Tanzania.
- To check the significance of subgroups, which influence the general significance of the main variable based on a three levels of stratification: geographical area, sex and age group.

Results

MANOVA. Mean values for risk perception, risk attitude, risk willingness and risk taking behaviour by Geographical area (urban, semi-urban and rural)

The curiosity of this analysis was to find out; is there a significant difference in subjective risk judgement related to traffic accidents between people experiencing different levels of system risk such as urban, semi urban and rural areas in Tanzania?

The results generally revealed a strong overall significant effect of geographical areas in risk perception, risk attitudes, risk willingness and risk taking behavior of Tanzanian public on traffic.

- People living in urban and semi-urban areas perceive lower risk of man-made related dangers associated with road traffic accidents than those living in rural areas
- The attitude towards rule violation is higher in rural areas than in urban and semi-urban areas. This could also mean that, people living in rural areas have positive attitude towards rule violation.
- The tendency of over speeding and risk driving is higher in rural areas and it indicates to be slightly lower in semi-urban and urban areas.

In addition, there was no significant difference between urban and semi urban areas in terms of road users risk perception, risk attitude, risk willingness and risk taking behavior. The context of physical and social cultural environment in urban and semi-urban areas in Tanzania seems to be

similar. This could also mean that; semi-urban traffic environment in Tanzania is more relating to urban traffic environment than rural traffic environment.

ANOVA. Mean values for risk perception, risk attitude, risk willingness and risk taking behaviour by Geographical area and gender

The curiosity of this analysis was to examine whether gender division (males and females) within a specific area (either urban, semi-urban or rural) can make a difference in risk perception, risk attitude, risk willingness and risk taking behaviour of road users in Tanzania.

- Males living in urban areas perceive sex and drugs related dangers lower than males living in semi-urban and rural areas.
- The attitude towards rule violation for the males living in rural areas is higher than males living in urban and semi-urban areas.
- Dimensions for risk willingness and risk taking behaviour become not significant if gender (males and females) is adjusted within the geographical areas (urban, semi-urban and rural areas)
- Females appeared none significant in all dimensions for risk perception, risk attitude, risk willingness, and risk taking behaviour, when gender (males and females) is adjusted within geographical areas (urban, semi-urban and rural areas).

ANOVA. Mean values for risk perception, risk attitude, risk willingness and risk taking behaviour by geographical area and age group.

The curiosity of this analysis was to examine whether age- group within a specific area can make a difference in risk perception, risk attitude, risk willingness and risk taking behaviour of road users in Tanzania. The results revealed that;

- The attitude towards rule violation for the age group 16-19years in rural area is higher than in urban and semi-urban areas.

- The attitude towards rule violation for the age group 20-24years in rural area is higher than in urban area.
- The tendency of speeding and risky driving for the age group 25-34 years is lower in rural area than in urban area
- The attitude towards rule violation for the age group 35-44years in rural area is higher than in urban and semi-urban areas.
- Risk willingness regarding signs and symbols for age group 35-44years in rural area is higher than in semi urban area.
- The tendency of speeding and risky driving for the age group 35-44 years is higher in rural area than in urban area
- The attitude towards rule violation for the age group 45+ years in rural area is higher than in urban and semi-urban areas.
- The tendency of slowing down due to pedestrian and darkness for the age group 45+ in semi urban area is higher than in rural areas.
- The tendency of slowing down due to danger condition for the age group 45+ in rural area is lower than in urban and semi urban areas.

ANOVA. Mean values for risk perception, risk attitude, risk culture and risk taking behaviour by geographical area, gender and Age group

This analysis was based on a three levels of stratification: geographical area, gender and age group. This intended specifically to check the significance of subgroups, which influence the general significance of the main variable.

The general overview of the results, portray similar pattern and tendency compared to results in analysis two and three. What is interesting is that, the relationship between gender and age-group in risk attitude, risk willingness and risk taking behaviour is stronger than between gender and type of geographical areas (urban, semi-urban and rural). This could imply that; demographic characteristics (gender and age group) and their composition in urban, semi-urban and rural areas

are more important for identifying differences in risk attitude, risk willingness and risk taking behaviour associated with road traffic accidents in Tanzania.

CHAPTER SIX

Factors influencing risk taking behaviour

6.0 Introduction

It is argued that, most road safety measures have to influence human behaviour in order to be effective (Scott, 2004; Elvik, 2005). Logically, a road safety measure (either road environment or vehicle safety devices) must influence one or more risk factors that contribute to risk taking behaviour associated with traffic accidents (Elvik, 2005). Identification of factors contributing to risk taking behaviour relevant to traffic system in Tanzania is the focus of this chapter.

This chapter is aimed to identify factors contributing to risk taking behaviour associated with traffic accidents and examine to what extent identified factors can be attributed to compositional condition in geographical areas (urban, semi-urban and rural) and to contextual condition. This may contribute to serve as the basis for designing appropriate road safety interventions suitable for Tanzanian context in relation to a set of factors identified to influence risk-taking behaviour. Serve as the basis for regulating road user behaviour within a given geographical area (urban, semi-urban or rural). Propose hypothesis about risk taking behaviour of Tanzanian public to be tested. In addition to specify the behavioural mechanisms in relation to causes of the cause through which adaptations to road safety measures can be designed.

To achieve this specific objective, two methods are triangulated; 1) the correlational method for modelling factors influencing risk taking behaviour and examine their variation effects by geographical areas. 2) Interviews for deep understanding of the reasons that govern such association (identified factors vs risk taking behaviour).

6.1 Modelling factors influencing risk taking behaviour

Based on theoretical account and the objectives of the study, several explanatory variables (such as, age, gender, geographical area, education level, religion belief, risk perception, risk attitude, risk culture, mobility exposure, risk willingness, level of income, etc.) were chosen for the

analysis. When these factors were tested/correlated (correlation matrix) only four factors turned out to be statistically significant for the analysis (refer table 33); 1) risk attitudes (.451**), 2) religious belief (.448**), 3) risk willingness (.260**) and 4) geographical area (urban=1 reference category) (.183**). Other factors, which turned out not statistically significant, are assumed if included for the analysis will have no additional explanatory effect beyond a set of significant factors (Howell, 2007).

Table 6.1. Correlation Matrix

		Gender	*Age group*	*Education level*	*Occupation status*	*Inner voice*	*Religion Belief*	*Risk attitude*	*Drink+ drive*	*Risk perception*	*Risk willingness*	*Geo-area*
Risk taking behaviour	*Pearson correlation*	.058	-.042	-.078	.030	-.036	.448**	.451**	-.027	.088	.260**	.183**
	Sig. (2-tailed)	.416	.527	.239	.654	.580	.000	.000	.677	.191	.000	.004
	N	227	233	230	228	242	246	215	243	221	233	252

**Correlation is significant at the 0.01 level (2-tailed) *Correlation is significant at the 0.05 level (2-tailed)

A stepwise, linear regression was processed to create the best-fit model from a set of four candidate factors. Statistical estimates, model fit, change in R square were selected for the output analysis of the model. In all the analyses, the 5% significant level ($\alpha = 0.05$), but do also recognize border significant 0.05 – 0.10.

First step. In the first analysis, Risk taking behaviour was selected as dependent variable and risk attitude as an independent variable. Risk attitude was chosen first due to the following reasons; 1) Traditional theories in psychology (for instance reasoned action by Ajzen & Fishbein (1980) and planned behaviour by Ajzen (2001), suggest that, attitudes are strong predictors of the behaviour. 2) Literature review indicates similar proposition (Paker et al., 1992; Åberg, 1993; Iversen, 2004; Iversen & Rundmo, 2004; Eiksund, 2009; Nordfjærn, Rudmo & Jørgensen, 2010). 3) Research from other discipline (such as psychology) use attitudes as one of the important dimensions in analysing human behaviour (Eagly & Chaiken, 1993).

The results indicated that; 19.9% of the variance (given by adjusted R square) in risk taking behavior was explained by risk attitudes, with a correlation effect (.451 (given by Beta coefficient)). The general analysis of variance ANOVA confirmed that; the model was statistically significant fit to the data $F(1,214) = 54.293$, $P < 0.01$ than usual 5% significant level (there are

214 (N-1) total degrees of freedom of the estimated parameter, with 1 explanatory factor and the ratio of the between group's variance and the within groups variance equals 54.293 (F statistics)). (Refer to table 6.2, model 1)

Second step. The second chosen independent variable for the analysis was "religious belief". "Religious belief was chosen the second due to the following reasons; first, several studies in western countries have examined the association between religious belief and human behavior and revealed a strong connection (Durkheim, 1976; Geertz, 1993; Kim, 2001; Jones, 2004; Giddens, 2006; Ellwood & Alles, 2007). Secondly, theories (i.e. reasoned action by Ajzen & Fishbein (1980), planned behaviour by Ajzen (2001) and risk culture approach suggest that, beliefs related factors (such as religions) are also important predictors of the behaviour. Third, 98% of Tanzanian public are religious (affiliated to religions) (URT, 2010; 2012; 2014).

When the second independent factor "Religious belief" was added in the model. The Adjusted R square increased to 30.9%. The correlation effect of risk attitude reduced to .384 compared to .451 in the first model and the factor religious belief had a correlation effect of .342. The overall correlation effect of the second model indicated that; risk attitudes have greater effect to risk taking behavior compared to religious belief. The model was statistically significant fit to the data $F(2,210) = 47.932$, $P < 0.01$ (Refer to table 6.2, model two)

Third step. The third chosen independent variable was "risk willingness". "Risk willingness was chosen the third by considering that, traffic safety in modern societies is ensured in terms of cash. Willingness to pay for risk reduction is hypothesized to be positively related to safe behavior (Beck, 1992). This is to say risk willingness is inversely proportional to safe behavior and direct proportional to sensational behavior. Fischer et al. (1989) found that people`s expressed willingness to pay for future risk reductions were greater for risks that presented a direct personal threat. A consent to take risk for avoiding personal threat manifest individualistic self-construal behavior (De Moij & Hofstede, 2010)

Therefore, when the third independent factor "Risk willingness" was added in the model. The Adjusted R square increased to 35.5%. The correlation effect of risk attitude continued going down to .345 compared to .384 in model 2 and .451 in model 1. In this model, Religious belief had a greater effect (.357) to risk taking behavior compared to risk attitude (.345) and risk willingness

(.173). The model was also statistically significant fit to the data F (3,199) = 37.556, P < 0.01 (refer table 6.2 model three)

Fourth step. The fourth independent factor was a "Geographical area". When this variable was added in the model. It was automatically filtered out by stepwise criteria; the p-value was .061 (boulder significant). The assumption is it could be significant if the sample size is enlarged. On the other side, the factor 'geographical area' is of a great interest based on the objectives of the study.

Therefore, to accommodate it in a model, the last step of the analysis was changed to enter method other than stepwise method to form model 4. The criteria used are at least border significance of the t-test and change in adjusted R square (an increase).

When the independent factor "Geographical area" was added in the model by enter method, the adjusted R square increased to 36.8%. The general analysis of variance ANOVA indicated that, the model was highly statistically significant fit to the data F (4, 198) = 29.770, p < 0.01 than usual 5% significant level (there are 198 (N-1) total degrees of freedom of the estimated parameter, with 4 explanatory factors and the ratio of the between group's variance and the within groups variance equals 29.770 (F statistics)). Hence, model four was chosen as the best fit model to explain risk taking behaviour associated to traffic accidents in Tanzania (refer to table 6.2, model four)

Table 6.2. Models indicating set of factors influencing risk-taking behaviour

	SIG. EFFECT P-value	COEFFICIENT BETA	COEFFICIENT B	DEGREE OF FREEDOM	Adjusted R square	DESCRIPTIVE STATISTICS VARIABLES	N	MEAN	STD
Model 1									
1. Risk attitudes	.000	*.451*	*.886*	*F(1,214) =54.293* *P < 0.01*	19.9%	• *Risk taking behaviour associated to road traffic accident* • *Risk attitudes*	*215* *215*	*48.78* *28.72*	*16.04* *8.16*
Model 2									
1. Risk attitudes *2. Religious belief*	.000 .000	*.384* *.342*	*.753* *3.163*	*F(2,210)=47.932* *P < 0.01*	30.9%	• *Risk taking behaviour associated to road traffic accident* • *Risk attitudes* • *Religious belief*	*211* *211* *211*	*48.78* *28.72* *3.26*	*16.10* *8.21* *1.74*
Model 3									
1. Risk attitudes *2. Religious belief* *3. Risk willingness*	.000 .000 .004	*.345* *.357* *.173*	*.674* *3.285* *.336*	*F(3,199)=37.556* *P < 0.01*	35.5%	• *Risk taking behaviour associated to road traffic accident* • *Risk attitudes* • *Religious belief* • *Risk willingness*	*200* *200* *200* *200*	*49.14* *28.81* *3.28* *17.70*	*15.99* *8.19* *1.74* *8.23*
Model 4 (the best fit model)									
1. Risk attitudes *2. Religious belief* *3. Risk Willingness* *4. Geographical area*	.000 .000 .005 .061	*.332* *.351* *.167* *.109*	*.644* *3.209* *.323* *3.795*	*F(4,198)=29.770* *P < 0.01*	36.8 %	• *Risk taking behaviour associated to road traffic accident* • *Risk attitude* • *Religious belief* • *Risk willingness* • *Geographical area*	*199* *199* *199* *199* *199*	*49.28* *28.79* *3.28* *17.72* *.29*	*15.92* *8.20* *1.74* *8.24* *.46*

*** P < .001 ** P < .005 * P < .05

The best-fit model (model four) informs that: 36.8% of the variance in risk taking behaviour associated with traffic accidents in Tanzania is explained by the contributions of 1) risk attitude, 2) religious belief, 3) risk willingness and 4) geographical area.

By comparing their correlation effects given by Beta coefficient (The mean change in the response for one unit of change in the factor). The results indicate that.

People with strong beliefs in their religion in Tanzania have low risk taking behaviours compared to people with moderate or no beliefs. (A unit (standard deviation) increase of religious belief is

proportional to a decrease of risk taking behaviour by 0.351***. (NB; the effect is positive but the scale was opposite).
People who posit positive attitude towards traffic rules violations perform more risky behaviours in traffic than those who posit negative attitude towards traffic rules violations. (A unit (standard deviation) increase of risk attitude is proportional to an increase of risk taking behaviour by 0.332***.

People containing high degree of willingness to take risk in traffic also perform more risky behaviours associated with road traffic accidents. (A unit (standard deviation) increase of risk willingness is proportional to an increase of risk taking behaviour by 0.167**).

Urban spaces in Tanzania signify more chances of risk taking behaviour associated with road traffic accidents geographical area (Urban=reference category).

By examining, which of these factors have greater effects on risk taking behaviour? The factor religious belief (My religion affect how I behave in traffic) has a greater effect (.351***) on risk taking behaviour compared to other explanatory factors.

6.3 Explanatory factors by geographical areas

Further analysis was done to examine the effects of factors influencing risk-taking behaviour by geographical areas (Urban, semi urban and rural). This aimed to examine the importance of place and space in understanding risk-taking behaviour at different context. The notion of context includes not only the situation in which the road users interact, but also the broader frame of physical and social cultural environment, that contribute to produce the specific situation.

Therefore, a multiple linear regression analysis was performed to examine factors by geographical areas; 1) Urban area based on cases for which Geographical area = Urban (sample of places within Dar es Salaam city centre and Arusha city centre). 2) Semi-urban area based on cases for which Geographical area = Semi-urban (sample of places within Arumeru district in Arusha and Dar es Salaam periphery areas). Moreover 3) Rural area based on cases for which Geographical area = Rural (sample of places within Shinyanga rural and Kahama rural villages).

Results (refer table 6.3) indicate that:

In urban areas, 13.8% of the variance in risk taking behaviour is explained by two factors 1) religious belief (.312) and 2) risk willingness (.232). The factor religious belief has a greater effect to risk taking behaviour.

In semi-urban areas, 18.8% of variance in risk taking behaviour is explained by only one factor, religious belief (.458)

In rural areas, 72% (very high degree of explanation) of the variance in risk taking behaviour is explained by only two factors: 1) religious belief (.219) and 2) risk attitude (.670). In this model, risk attitude has a greater effect to risk taking behaviour than religious belief

Table 6.3. Factors influencing risk taking behaviour by geographical areas

	SIG. EFFECT P-value	COEFFICIENT		DEGREE OF FREEDOM	R square & Adjusted R square	N
		BETA	*B*			
Urban area						
1. My religion affect how I behave in traffic	.001	*.312*	*2.605*	*F(3,116) =6.16*	13.8%	117
2. Risk Willingness	.018	*.232*	*.426*	*P < 0.01*		
Semi-urban area						
1. My religious affect how I behave in traffic	.000	*.458*	*3.473*	*F(3,78)=5.394* *P < 0.01*	18.8%	79
Rural area						
1. My religious affect how I behave in traffic	.035	*.219*	*2.458*	*F(3,48)=37.03* *P < 0.01*	72.0 %	49
2. Risk attitude	.000	*.670*	*1.232*			

*** P < .001 ** P < .005 * P < .05

The overall observation of the findings indicates that. Geographical area is one among important factors to be taken into account when determining the magnitude of effect of factors influencing

risk-taking behaviour. Construct of risk taking behaviour varies substantially by geographical areas. For instance, when independent factors were modelled based on a total sample of Tanzanian public, the factors 'risk attitude and religious belief' formed a model in which 30.9% of the variance in risk taking behaviour was explained by the factors. When the independent factors were analysed based on sample cases of geographical areas (urban, semi-urban and rural), the same factors 'risk attitudes and religious belief' formed a rural model in which 72% of the variance in risk taking behaviour was explained. This implies that; spatiality can make a difference in determining the magnitude of effect of factors influencing risk-taking behaviour.

Another observation of the findings indicate that; in rural areas, risky attitudes are more attributed to risk taking behaviours. This observation complements to results of other studies. For instance, following Jørgensen (2009), risk compensation might be more frequent in rural and sparsely populated areas due to the nature of such areas; in rural areas, the travelling distances are longer, with higher prospects for reaping benefits such as time saving by over-speeding and risk taking. On the other hand lower levels of rural police enforcement and less public social control intensify the advantage (Jørgensen 2009). Furthermore, in the western countries there are regional variations in risk attitudes and driving behaviours, with more disadvantageous risk culture in rural areas (Eiksund 2009; Rakauskas et al 2007).

A peculiar finding in this analysis is about the factor religious belief. When examining the overall extent to which risk taking behaviour is explained by independent factors, religious belief indicated a greater effect to risk taking behaviour than other independent factors. When the independent factors were controlled by geographical areas (urban, semi-urban and rural), the factor religious belief indicated a significant effect to risk taking behaviour in each geographical areas. However, this factor was analysed based on a single item, which could also mean lower validity than composite measured variables. Single items in statistical analysis may be considered unstable or encompassing less robust. When the item religious belief together with other related items were subjected to a principal component analysis (factor analysis), to determine their measures of internal consistency (dimension structure), there was no inter-item correlation (reliability) with other items to make up a scale (consistent strong dimension and composite variable), the alpha coefficient was far less than 0.70.

Therefore, this demanded further analysis to examine whether the observed relationship between religious belief and risk taking behaviour is explained by mediation or spurious factors?

6.4 Examining relationship between religion belief and risk taking behaviour

A four-step data analytic method by Baron and Kenny was used to create a mediation model. The aim is to identify and explicate the mechanism or process that underlies an observed relationship between religious belief and risk taking behaviour via the inclusion of a third explanatory factor, known as a mediator factor.

Rather than hypothesizing a direct causal relationship between religious belief and risk taking behaviour, a mediational model hypothesizes that the religious belief influences the mediator factor, which in turn influences risk-taking behaviour. Thus, the mediator factor serves to clarify the nature of the relationship between religious belief and risk taking behaviour.

Several contextual and composition factors (such as gender, age, geographical area, education, attitudes, self-rated driving distance per months etc.) were each introduced as a third factor, to check if the association between religious belief and risk taking behaviour was reduced or disappeared when controlling for a third variable.

The correlation matrix was run to examine 1) direct effect between religious belief and risk taking behaviour, and 2) to select qualified 'candidate factors' for the mediation analysis (as a third factor). Based on correlation matrix; 1) the direct correlation effect between religious belief and risk taking behaviour indicated .448 and 2) only three factors qualified for mediation analysis; 1) risk attitudes, 2) Inner voices and 3) risk willingness.

A partial correlation was processed between religious belief and risk taking behaviour by controlling each third factor (mediator factors). The results (illustrated in table 6.4) generally revealed a very weak trivariate mediation effect (Risk attitudes by .073, inner voices by .063 and risk willingness by .006) that bridges the causal relationship between religion belief and risk taking behaviour.

Table 6.4. Mediating factors between Religious belief and risk taking behaviour

	Direct effect	Indirect effect (by controlling a third variable)	Amount of Mediation (Direct effect – indirect effect)	
Religious belief	.448	Risk attitude .375	.073	**Risk taking behaviour**
		Risk willingness ..442	.006	
		If one does not follow ones inner voice, society will fall apart .385	.063	

The overview of the results can generally be interpreted that; the association between religious belief and risk taking behaviour is a direct link. The amount of innate characteristics given by the trivariate factors is too little to undermine its direct effect.

6.5 Discussion of a deeper understanding of the association between factors and risk taking behaviour

The first part of the analysis in this chapter was to identify and examine a set of explanatory factors that can be used to explain risk-taking behaviour of Tanzanian public in traffic. The results revealed that, 36.8% of the variance in risk taking behaviour was explained by the contributions of risk attitude, religious belief, risk willingness and geographical area. The factor religious belief (My religion affect how I behave in traffic) had a greater effect compared to other explanatory factors.

The second part of the analysis was to examine the variation effects of factors by geographical areas. The results indicated that, 13.8% of the variance in risk taking behaviour in urban areas was explained by two factors, religious belief and risk willingness. The factor religious belief had a greater effect. 18.8% of variance in risk taking behaviour in semi-urban area was explained by only one factor, religious belief. In rural areas, 72% (very high degree of explanation) of the variance in risk taking behaviour was explained by only two factors; religious belief and risk attitude. Risk attitude had a greater effect to risk taking behaviour than religious belief. Therefore, geographical areas revealed to be important factors when determining the magnitude of effect of factors influencing risk-taking behaviour.

In this part, qualitative information is explored to provide deeper understanding about the reasons and associations between the explanatory factors and risk taking behaviour.

6.5.1 Religious belief and risk taking behaviour

It was revealed by statistical results that, the factor 'religious belief' (My religion affect how I behave in traffic) has a greater effect on "risk taking behavior associated with traffic accidents" than other explanatory factors. People with strong beliefs in their religion have lower risk taking behaviour associated with road traffic accidents compared to people with moderate or no beliefs. This finding demands a further understanding and explanation. Here also qualitative methods will be employed. The interview material is described in chapter 4.

In Tanzania, religions are among the most important institutions, and they are a primary source of most deep-seated norms and values (IRF, 2007). According to recent estimates, almost 98 percent of the population has a religious faith (Christians, Muslims or Animistic). The national constitution offers freedom of religion (URT, 2010), and religious organizations are considered as development partners of the Government (DFID Tanzania 2010) and have been strongly associated with public institutions (such as schools (education sector) and hospitals (health sector)), the family affairs, government affairs, and political hierarchies (DFID Tanzania 2010).

To what extent does religion belief/faith contribute to risk taking behaviour associated with road traffic accidents in Tanzania? A parish priest and a chairperson of the union of religions in Tanzania (aged 52years, and worked as a priest for 24 years) was interviewed as a key informant representing people with religious faith.

Religion or belief helps us to deal with problems of human life that are significant, persistent, and intolerable.

To him, this is one of the important ways in which religious beliefs can accomplish this. By providing, a set of ideas about how and why the world is put together that allow people to accommodate anxieties and deal with misfortune.

Road traffic accidents are one of the misfortunes that a human being can easily get into unexpectedly. Innocent children can be killed; old people can be killed or seriously injured, these are not drivers, they are pedestrians, passengers, innocent road users. Religion teaches people to absolve unexpected pains, and not revenging misfortunes, put love and God first.

According to this informant, in most cases politician blames religious people about the use of behavioural faults and predestination as God's will to justify death on the streets, arguing as a deliberate misuse of the word of GOD to underplay human faults.

Look here, we teach people together with politicians themselves to love each other. Love is the great commandment. If you love people, you will not kill them or endanger them. We should not blame the driver directly, it might be an accident due to vehicle fault and people involved are innocent, just suffered the consequences.

Based on the information from the key informant, we can depict three important issues that can link religion values/ beliefs and risk taking behaviour associated to traffic accidents: 1) the aspect of tolerance to traffic related risk, 2) accommodation of anxieties related to accident risk, and 3) the aspect of reconciliation to the consequences of accident risk.

Tolerance to traffic related risk is socially constructed behaviour that has a meaning and commitment to some values. According to Triandis, (1994), individuals who are strongly internalised with cultural values and norms, exhibit more tolerance behaviour to uncertainties that have no implications to their core values. Totton & Jacobs (2001) have defined the term tolerance as a fair, objective, and permissive attitude toward practices that differ from one's own practice. Therefore, tolerance to traffic risk in this circumstance can be interpreted that, due to strong influence of their religion values, religious people exhibit fair and objective behaviour to uncertainties associated to traffic accidents. Moreover, this is due to the fact that; the mitigation measures do not harm the core values of religions to the contrary it is. Jones (2004) reported similar findings that, the use of condom to prevent HIV infection is not an appropriate measure to religious people (especially Christians) for it interrupts the core values of their faith on sex relation.

The essence of accommodating anxieties of accident risk indicates the use of religion beliefs and values to simplify and justify problems associated to traffic risk. Barlow (2000) and Sylvers et al. (2011) have defined accommodation of anxieties as a behavioural tendency of silencing unpleasant feelings of dread over something unlikely to happen. The essence of accommodating anxieties of accident risk can therefore be interpreted as, religious norms and values play an important role in the justification, and simplification of the pains resulted from road traffic accidents. Perhaps this essence can contribute to understanding why the problem of road traffic accident in Tanzania is not prioritised as a serious problem to be tackled.

On the other hand, the aspect of reconciliation to the consequences of accident risk by religious people indicates a significant reflection of traffic related behaviour that led to an accident in relation to their core values or faith. A theological meaning of reconciliation is referred as returning to faith or harmony after a conflict or disaster (McGrath, 1998: Spong, 2001: Migliore, 2004). Hence, reconciliation to the consequences of accident risk can be interpreted as an adjustment to traffic behaviour based on religion values and norms that can eventually reduce or avoid similar accident causalities. For instance, when a religious person think about accident causalities, which is, either killed or injured persons, in relation to their religion values: *you shall not kill or harm your neighbour.* This circumstance obviously suggests to them, to behave properly on traffic and avoiding accident causalities. In addition, perhaps this aspect can contribute to the understanding of how religion influence low propensity to take risk on traffic or traffic rule violations.

The essence of politicians blaming the religious people about the use of behavioural faults to justify death (related to traffic accidents) gives some clues to individual's reluctance (behaviour) when exposed to technological uncertainties. This particular essence indicates a significant difference of their types of worldview. Douglas (1978) argues that, people perceive different levels of risk according to their type of worldview. People with strong feeling of unity and individualism (like religious people) are allocated at the first end category, whereas Politicians who are interdependent and rational, to others are allocated at the other end category. Individualism (as a moral stance) holds that; individuals (groups of likeminded) taking part in a society attempt to further their own interests, without taking the interests of society into consideration (Brown, 1993: Renaut, 1999: Barzilai, 2003: Gagnier, 2010: Albrecht, 2012). Theoretically, the cultural approach proposes that: people who manifest an individualistic worldview will perceive high risk of hazards that could reduce or interfere with their individual freedom (Douglas 1978: Grossberg et al.,, 1992: During, 2003: Edgar & Sedgwick, 2005). Therefore, the individualistic moral stance (attitude or view point that helps to make a decision) manifested by religious people (such as *Ten commandments of God*, *right conduct*, *love, respect, peace, harmony, patience etc.)*, contribute significantly to low risk taking behaviour associated with traffic accidents.

When interviewing a primary informant a common argument hypothesised a similar trend, *a religious man is always expected to behave appropriately even though not all practice what they preach…* An argument that, a religious man is always expected to behave appropriately on traffic

indicates a positive association between personality trait of a religious man and low risk taking behavior associated to traffic accident. To engage into appropriate behavior is a choice an individual has to make (Scott, 2004: Al-Hemoud, & Al-Asfoor, 2006: Daniels & Agnew, 2010). Behind this choice lies values, norms, beliefs, feelings and knowledge in which an individual has acquired (Daniels & Agnew, 2010).

When a person is called religious, it means that he/she is internalized with religious values and norms and committed to commandments (religious laws) as a guide of his/her life and behaviour, (Balter, 2005). For instance, Christians have Ten Commandments of God written in their holy bible (The Old Testament, King James Version, Exodus 20. 1-17). One of the commandments states that, "*you shall not kill"*, and it is translated as a great sin and difficult to be forgiven by God. Therefore, in any circumstance, a religious person is not expected to make a choice of engaging into behaviour that might lead to death risk. Moreover, perhaps this can contribute to understanding why a religious man is expected to behave properly on traffic as the primary informants have pointed out.

On the other side, it was also noted from a primary informant that, *it is quite easy for religious people to disseminate information, teachings, values, feelings and rules that may govern how people live their lives than how politicians do*. *Religion values and norms affect largely how people behave in traffic whether positively or in a negative way.*

The essence of religious people (as a social group) to easily disseminate information, teachings, values, feelings and rules that may govern how people live their lives than politicians, indicates some elements of power relations. Power is referred as the ability to influence the behaviour of people (Pip, 2008: Vatiero, 2009). While power relations are referred to the matrix of possible actors and their possible interactions, in which individual or group of people are able to coerce, oblige, command, direct or influence the life or lives of others (Greenwood, 2007: Condon, 2007). Social groups have strong power mechanisms (lobbying, safety-net, and sensitisation) to influence 1) the government on issues relating to policy, development, governance, safety etc. (Spring & Grimm, 2007) and 2) the public on issues that harm the society, for instance campaigns about traffic safety can be sensitised by religious people at funerals of accident victims . In Tanzania for example, DFID report (2010) noted that, religious organizations have strong social network throughout the country, and their credibility lies upon constructive role they play in community

development projects and their capacity to reach the vulnerable groups. This observation is similar to several other studies which identified religious organizations as part of civil society organisations (named as charitable organisations) (Rodney & Thomas, 2003: Smillie, & Larry, 2004: Teegen & Vachani, 2004), and have been marked to perform roles of NGOs and INGOs worldwide (Teegen, 2003: Witt, 2006: Brinkerhoff et al, 2007). In general, religions in form of social organisation and their social network can use interpersonal methods of communication to influence the government and public on issues of road safety policy-making. Being part of the NGOs is also a unique position to share its values and capable to reach and influence behaviour of both believers and non-believers throughout the country. Perhaps this situation can contribute significantly to the understanding why religions have a significant effect to risk taking behaviour in all geographical areas (urban, semi-urban and rural areas).

The phenomenon that religious organisations are integrated to public institutions indicates a strong network between religious organisations and the government in providing social services to the Tanzanian public. This implies that, religious organisations play varying roles in setting moral and behavioural standards to the public. For instance, URT reports (2010 and 2012) about health and education in Tanzania indicate that: Missionaries (Religious organisations) own the most effective and well performing hospitals and schools. Statistically, 40% of the academic institutions in Tanzania are owned by religious organisations, 70% of the private hospitals are owned by religious organisations, and the most funded charity organisations are religious organisations (Mukandala, 2006: Yahya-Othman, 2006: Mesaki 2011). These two sectors (education and health sectors) are named essential in road safety measures in a contextual dimension (ITF, 2008, OECD 2010, WHO, 2010). Road safety education is taught in elementary schools in which religious organisations are strongly involved. Likewise, hospitals, including those owned by religious organisations play a significant role in recording accident related causalities for the national database and for the sensitisation programs about the effects of accident causalities. Perhaps this phenomenon can contribute to understand how religion plays a significant role to the public institutions in shaping risk-taking behaviour associated to traffic accidents in Tanzania.

The other connection that can depict the association between religious belief and risk taking behaviour can be observed through rituals. In Tanzania, religious rituals are derived to symbols and integrated to routine activities (such as driving) for the belief of protection and guidance by

the power of the spirit (Perception of power control). For instance, its common to see a Rosary (for Christians) and Tasbee (for Muslims) hanging in the front wind screen of their private cars, believing that it protects them from any traffic related risk and they feel secure (protected) by the spirit of God. This is similar to public busses, most of them have stickers with biblical words or Koran words such as *In God We Trust, Jesus is My Savior, Allah Akbar... etc.* These are generally ritualized symbols that religious people feel protected by, the spirit of their almighty father (God). Religious symbols experienced in both private and public busses, can perhaps contribute significantly to the understanding why the judgment of the probability to be involved in an accident is very low by religious people.

On the other side, the connection between ritualized forms of religions and traffic related behaviour can also be noted when the society attempt to provide solutions to social and technological hazards. This in a way has been a point of departure between religious people and traditionalist (Jones, 2004). One practice can be perceived right by traditionalist and wrong to religious people depending on modalities. In Tanzania for instance, traditionalist people associate road accidents to superstitions and to avoid it they have to call upon the powers of their ancestors to protect them. While religious people associate road accidents with misfortunes, and sometimes they blame themselves, maybe they have not done well for God and the accident is interpreted as a punishment from God. For them in order to avoid road accidents, their best option is to be humble, reflect their behaviour and pray to God for the protection (Banyikwa, 2005: IRFR, 2007). To some extent, this can also explain their low propensity to traffic rule violations.

When interviewing the primary informants (Four village elders aged between 50 and above representing traditionalist people) at tumbi/ mailimoja villages, about the association between rituals and traffic accidents, they strongly argued that:

Religious beliefs facilitate more accidents than reducing, we all know how these religious people are unconcerned to several hazards, for instance when it comes to HIV/AIDS they tell people not to use condoms and people die including their members. When it comes to road traffic accidents especially to the areas where roads were constructed across cemetery yards, they tend to ignore our traditional rituals and convince their members to avoid it, for it is not important, not allowed, unnecessary and has no effect in reducing road accidents. This has resulted in prolonged accidents in our villages, we know this is a punishment from our ancestors; they need us to practice our culture to avoid such punishments. There would have not been that many accidents if traditional rituals could be practiced.

It shows that: there are times when religion values and traditional values seem to be at odds in combating technological and other social hazards such as traffic accidents, diseases etc. Both religious people and traditionalists have the same ritualized trend of calling upon spiritual powers/ forces for their protection (religious people from God while Traditionalist from Ancestors), their main difference is about the interpretation of the hazard, for traditionalist, they have a feeling that other bad spirit forces interrupt their freedom hence they call their ancestors to fight against. While religious people interpret hazards based on their own behaviour, for them, God wants them to behave harmoniously, if they go against, God will punish them through accidents, their solution is always to change their behaviour. The aspect of changing behaviour by religious people implies their adjustment to properly follow the traffic rules and regulations. This situation can relevantly contribute to the understanding why people with strong beliefs in their religion have low risk taking behaviours associated to road traffic accidents compared to those with moderate or no religious beliefs.

6.5.2 Risk attitude and Risk taking behaviour

The regression analysis has revealed a significant correlation between risk attitude and risk taking behavior. People who posit positive attitude towards traffic rule violation perform more risky behaviours in traffic than those with negative attitudes towards traffic rule violations. Risky attitude is more attributed into risky behaviour in rural areas than in urban and semi-urban areas.

Attitudes are referred to person's inner thoughts and feelings, while behavior refers to outward expression of attitude (Ajzen, 2001; Gerd, 2002: Dolores et al. 2005: Maio & Haddock, 2010). In most cases, behaviour is a reflection of attitude (Ivesen, 2004 Eiksund, 2009). Ajzen (2001) identified that; Strong attitudes can be automatically activated into behaviour. This means that, attitudes can positively or negatively affect a road user's behaviour.

There is a potential shortcoming in the literature regarding attitudes towards road safety and driver behavior in Tanzania. There are also few empirical accounts investigated differences in attitudes towards road traffic safety and driver behavior across high income and low-income countries (Nordfjærn et al., 2011). Studies, which investigated attitudes towards road safety and driver behavior in low-income countries, were non-comparative to high-income countries. For instance,

Lund and Rundmo (2009) found that, subjective risk judgment and driver attitudes explained a total of 54% of variance in Norway, whereas the same variables explained 19% of the variance in Ghana.

The results in this analysis are in line with the studies on reasoned action and planned behavior. These studies revealed that; the likelihood to engage in specific behaviours is predicted by personal attitudes and norms regarding such behavior (Ajzen & Fishbein, 1980: Wood, 2000: Ajzen, 2001; Forgas et al., 2010). According to the theory of reasoned action, if people evaluate the suggested behavior as positive (attitude), and if they think their significant others want them to perform the behavior (subjective norm), this results in a higher intention (motivations) and they are more likely to do so. A high correlation of attitudes and subjective norms to behavioural intention, and subsequently to behaviour, has been complemented qualitatively when interviewing the key informant. A Psychologist Professor at the Department of Psychology, University of Dar es salaam (a female, aged 57years).

…… Even though our attitudes are not visible externally, we can definitely tell based on our common behaviours we are experiencing every day. Moreover, it is indeed possible to predict attitudes of road users in Tanzania by reviewing their common tendencies on traffic. Positive attitude can be detected when road users behave properly on traffic and negative attitude can be detected by improper behaviours on traffic. According to my experience, most drivers especially men have negative attitudes to low speed (Men are always over speeding and overtaking unnecessarily), pedestrians and drivers have negative attitude to the road signs especially zebra crossing (drivers do not stop at zebra crossings, and pedestrians tend to cross everywhere they wish to, no matter how close a zebra crossing is). Most drivers are impatient to wait for the green rights, you can detect this especially at night when police are not there. People have negative attitude to the use of seat belts (even my children always argue about that, they are not comfortable, even do not like it). I am quite sure; you have experienced the same in this country ……..

According to the informant, a person who has positive attitudes towards traffic rules and regulations (such as speed limits, road signs, etc.) can positively drive or use roads safely in any role a person is assuming (e.g. as a driver, pedestrian, cyclist, etc.). These positive attitudes are usually manifested in a person's driving behaviour. In much the same way, a person who displays negative attitudes towards traffic regulations will accordingly drive unsafely.

Studies that investigated attitudes towards road traffic safety and behaviour in low-income countries were mostly non comparative in nature (e.g. Yunesian et al 2008). A great number of studies in western countries have been successfully relating attitudes towards traffic safety to driver behaviour (Ulleberg, 2003; Iversen & Rundmo, 2004; Scott, 2004; Moen & Rundmo, 2005; Jørgensen, 2009). For instance, Iversen and Rundmo (2004) investigated attitudes to traffic safety and driver behaviour in Norway, the results indicated that, attitudes to driving explained a significant amount of variance in driver behaviour, Nordfjærn, Jørgensen & Rundmo (2010) found that, driver's attitude traits are strong predictors of Driver behaviour.

In addition, the findings also revealed that, the effect of risk attitudes in risk taking behaviour differ substantially by geographical areas (urban, semi-urban and rural). In addition, risk attitudes are more attributed to risk taking behaviour in rural areas. This finding complements to other cited studies that have also indicated some differences between urban-rural attitudes towards risky driving behaviour (Diener & Richardson, 2007; Rakauskas et. al. 2007). For instance, Rakauskas ET. Al (2007) found that, individuals in rural areas reported more driving under influence of alcohol and they were less likely to put safety devices such as seat belts. Diener & Richardson (2007) revealed pick-up drivers from rural areas were less seat belt user than majority of urban drivers.

Alternative explanation for the differences can be due to contextual and compositional conditions in the geographical areas. Even though very few studies which investigated such differences. Education could also be an important factor for such differences. People that are more educated are found in urban areas than in rural areas in Tanzania (URT, 2010). Nordfjærn and Rundmo (2009) suggested that, individuals with higher education tend to live and drive in areas that have higher investment in roads and other transport safety features. To them safety investments are likely to be higher in urban areas than in rural areas. Furthermore, it is possible that individuals with higher education drive safer and more expensive vehicles, and therefore experience the need for safe driving (Nordfjærn & Rundmo, 2009).

In general, if road safety interventions have to be implemented in Tanzania, it might be relevant to focus more on attitudes factors to improve traffic behaviour. Attitudes towards road safety are considered to play a major role in how people behave in traffic.

6.5.3 Risk willingness and Risk taking behaviour

The results from the regression analysis have indicated a positive correlation between risk willingness and risk taking behaviour. People with high degree of willingness to take risk in traffic also perform more risky behaviours associated with road traffic accidents.

The association between risk willingness and risk taking behavior has been assessed by several studies (Douglas, 1985; Adams, 1995: Slovic, 2000: Wilde, 2002: Moen, 2008: Ale, 2009). Risk willingness refers to individuals consent to engage into actions that have the potential to be harmful or dangerous and, at the same time provide the opportunity for some kind of outcome that can be perceived as positive (Ale, 2009). What is perceived to be an important goal to attain is considered as an important stimulus of individuals to create consent to take risk Rosa 2003: Henriksen & Uhlenfeldt, 2006).

The primary informant identified poverty in Tanzania is used as a justification stimulus of purchasing and importing reconditioned (used) cars in the country.

The majority of Tanzanians cannot afford to purchase brand new cars, which are well equipped with safety devices (due to existing poverty); they can only afford second hand cars, which could be almost worn out and unsafe. Therefore due to low income, people are willing to take the risk of importing cheap and reconditioned (second-hand) cars with no safety guarantee……..

According to WHO (2009) there are two types of poverty people can experience in a place: 1) Absolute poverty which refers to the deprivation of basic human needs, which commonly includes food, water, sanitation, clothing, shelter, health care and education. Moreover 2) relative poverty which is defined contextually as economic inequality in the location or society in which people live (WHO, 2009). Both types of poverty is experienced in Tanzania, relative poverty is more experienced by people with regular income (employees, entrepreneurs, professionals and the government etc.), while absolute poverty is more exerted to unemployed and the poor who are mostly non-motorised road users.

The risk tendency of importing used cars in Tanzania signifies relative poverty of people not affording the cost of new cars, likewise the risk tendency of accepting imported used cars to operate in a system signifies also a relative poverty experienced by the government (no strict regulations have been implemented to control the quality of the imported cars). There is no age

limit of the imported cars in Tanzania (TARA, 2012) and no regular periodic control of the vehicles is carried out by responsible authorities in the country (Massaoe, 2007; TARA, 2009). This situation has facilitated more worn out vehicles to operate in the system. Hence, the extent to which people develop consent to engage into risky behaviour of importing used or worn out vehicles in the traffic system is significantly contributed by poverty, and in turn risk willingness.

Another perspective was explored when interviewing commuter bus driver in Dar es Salaam. According to primary informant corruption facilitates drivers consent to violate traffic rules despite the existence of traffic rules and traffic police to enforce the rules.

...Drivers are willing to take risk of violating traffic rules; simply, they will cheaply pay the police. A penalty for driving without a driving licence cost 20,000Tsh (about 12USD), and the police accept 2000Tsh (about 1USD) to dismiss you from the penalty, Police salaries are very low, and corruption is an alternative for their extra income to sustain their lives. You can buy a driving licence before knowing how to drive. It is therefore not a big deal for anyone to drive even if you are not a driver...

Corruption by traffic police is regarded as stimuli that influence the drivers to develop consent of risk taking behaviour. Reinforcement of traffic rules by traffic police is weakened by underpayments. Corruption by traffic policy indicates to be petty (TARA, 2007). "Petty" corruption occurs at a smaller scale and occurs within established social frameworks and governing norms. In Tanzania, a small cash amount is very common bribe exchange between drivers and traffic police (TARA 2007). This form of corruption is particularly common in most developing countries where public servants are significantly underpaid

Similar findings were revealed by other organisations who researched about the magnitude of corruption in Tanzania. According to TARA (2007), traffic Police in Tanzania are considered chronic to corruption. It is a very common practice for a traffic police to engage into petty forms of corruption even when drivers have not violated traffic rules (CHR, 2006: TARA, 2007). Commonwealth Human Right Organisation (CHR) released a report in 2006 claiming that: a police department was the most corrupt in Tanzania.

In developed countries, sensation -seeking (Zuckerman, 1994) and excitement seeking on risky driving behaviour are considered different scales to measure general concept of people's willingness to take risk (Oltedal & Rundmo, 2006). In Tanzania and perhaps many other

developing countries, the degree of willingness to engage into risky driving behaviour is more associated to economic scales (factors) than sensation-seeking or excitement-seeking.

6.5.4 Geographical areas and Risk taking behaviour

The statistical analysis revealed a significant effect and positive correlation between risk taking behaviour and geographical area. Urban spaces in Tanzania signify more chances of risk taking behaviour associated with road traffic accidents (geographical area (Urban=reference category)).

Tanzania by geographical areas (urban, semi-urban and rural) also has varying degree of physical and social cultural environment contributing to risk taking behavior. Broader underlying contextual and compositional factors within country geographical areas (urban, semi-urban and rural) were qualitatively explored. Dar es Salaam city Centre representing urban areas, Arusha representing semi-urban areas, and Shinyanga representing rural areas.

Business and traffic exposure, Dar es Salaam is Tanzania's most important city for both business and the government. The city contains high concentration of trade businesses and other public services in which travel demand (mobility) is very high. Therefore, people living in Dar es Salaam city are more exposed to traffic risk due to the distances they cover every day (travelling to and from the working place). Public transport is not reliable, and most people rely on private cars. Most drivers in the city of Dar es Salaam are rough and unprofessional especially those who are driving commuter buses (*Daladala*).

Primary informants living in Dar es Salaam city (n=10) considered private cars are more reliable than public transport. To them mobility demand in urban areas is very high, and it necessitates individuals, to privately own automobiles despite its negative effect in terms of accident related risk or economic related burden in running private cars.

....."You can't be successful to your business in town if you are not mobile, owning a private car is no longer a luxury, it is now one of the basic needs in a house like a kitchen or toilet" ……..

Private cars are considered necessary and a basic need in a house. This information gives some clues to the elements of modernization perspective that: Automobiles in modern societies stand as a symbol of power; therefore, people strive to attain the symbol. Automobiles provide privacy and complete freedom of the owners, therefore people living in towns and cities fight for mobility

freedom. Automobiles provide personal pleasure and self-reliance to owners; therefore, personal pressure and self-reliance are cherished ideals in a modernized society. Automobiles provide the most efficient trip linking organization between trip origins and trip destinations, therefore modern society wants to be on time (Button, 1993: Small & Gomez-Ibanez, 1998; Vaconellos, 2001; Banyikwa, 2005).

It could be argued that, mobility demand force in urban areas has rapidly increased the population of the vehicles in Tanzania, and the country has not managed to provide sufficient infrastructures and safety policies to accommodate safe mobility of both motorized and non-motorized. Hence, high risk taking behavior associated to traffic accidents in urban areas.

Arusha is a global tourist destination and is the centre of the northern Tanzania safari circuit. Arusha is a major international diplomatic hub. The city hosts and is regarded as the de facto capital of the East African Community. The national parks and reserves in this region are central to business activities and a major source of income of the region. Due to tourism activities and international diplomatic activities, driving in Arusha is very professional. International organizations and tourism companies demand a professional driver for the formal employment. These activities to some extend have significantly influenced traffic behavior to be of its own kind. Traffic is calm and smooth compared to other cities or towns. Safety culture is more constructed to appeal to foreign tourists. It was even noted that, the level of corruption by traffic police is very low compared to other cities.

In rural areas (Shinyanga), roads especially trunk roads across villages are marked as open market for petty trade. Villagers especially women and children tend to congregate to the highway and sell fruits, and beverages to the passengers. This kind of business has increased more risk taking behavior in rural areas, for instance, they have to stand at the middle of the road in order to access passengers seated on the road side, therefore this situation place them at high risk of being killed or injured by other vehicles passing through.

Gender, religion and traffic exposure. The cultural norms and history of Dare es Salaam and other coast regions in Tanzania are associated to religion values. There are more Muslims in Dar es Salaam and other coast regions. Dar es Salaam city is estimated to contain a population of more than 50% Muslims. In traditional Muslim families, women especially wives (polygamy is also applied) are not allowed to travel or leave home except for certain purposes. In coast region areas

including Dar es Salaam, beliefs about what it means to be a male (boy) or a female (girl) in terms of physical appearance, attitudes, interests, psychological traits, social relationships and occupations are based on religious faith. Gender stereotypes about Traffic related occupations in these areas are characterized as typically masculine activities. Driving is regarded as masculine career especially when it comes to commercial/professional driving in public buses or commercial vehicles like Lorries or Trucks. This situation has contributed significantly to reduction of most Muslim women to involve into driving as carrier; they rather participate on private cars as part of their domestic activity. Therefore, there are more males (almost all) in Dar es Salaam city driving public buses and commercial trucks or Lories and women are more visible as car occupants in private cars or driving private cars.

Similar trend can be noticed in Arusha and Shinyanga; the cultural norms of several tribes in Tanzania regard driving and travelling activities as more masculine relevance than feminine. However, due to the influence of tourism activities and international activities in Arusha, cultural norms are more directed to attract tourists as source of income, also women are more exposed to the traffic system as professional drivers, and the number of women drivers in the tourist companies is a bit reasonable to justify their presence. Therefore, in urban areas, driving opportunities for commuter busses or public busses are more open to males. Males' attitude towards rule violation is identified to be very high compared to women, and attitudes are found to be strong predictors of behavior. This might also imply that urban driving in Tanzania contains more risk taking behavior due to the high number of male drivers in these areas. In semi urban areas, the sample areas used to represent these areas indicate an even number between male drivers and female drivers. Females are low risk takers and male drivers in Arusha are more ethical concerning driving rules due to safety culture influenced by tourism industry in the area, therefore there is low risk taking behaviours on traffic than in urban areas.

In rural areas (Shinyanga), very few people own vehicles; the traffic volume experienced is "on transit" through highways across villages. Driving style and behavior of the "on transit" vehicles is the same as those in urban areas. "On transit" drivers are urban residents (mostly males). Due to the open spaces in such areas, speeding is more common. (Their risk attitudes are stimulated even more by the environment to encourage speeding thus saving travelling time).

Education and traffic exposure, In Tanzania, skilled people are more located in urban areas especially Dar es Salaam and this is due to labour market demand. They are well paid and able to own private cars. They occupy regular jobs, which demand them to travel more than those with unstable or no occupation. This situation in a way can partly explain high congestion of traffic in Dar es Salaam city especially at peak hours, and their risk taking behaviour due to context of their environment they live and work. Vasconcellos (2001) argues that: in any society, mobility increases with income. People with higher incomes (mostly skilled) will travel more than those with lower income (Vasconcellos, 2001). URT (2010) and Police report (2010, 2011) indicated that, skilled people in Tanzania are more reported for speeding or frequently crossing red lights, and the most common plea to their traffic offences are 1) being late for the important meetings or 2) an emergency case to attend e.g. Medical Doctors to attend a sick person.

In rural areas (Shinyanga), there are very few people with higher education; the few are retired people or professionals temporarily residing for a purpose. Traveling distances within village centre are low and the system risk is very low due to low level of motorisation.

The physical environment, In urban areas, Dar es salaam in particular, the co-existence of high-speed motor traffic and low-speed pedestrian traffic is very critical for accidents especially in areas of intense pedestrian traffic like commercial areas, bus stops, parks and schools. The street systems in Dar es Salaam have been constructed and adapted to allow for greater mobility of automobiles in space, implying high average speeds for vehicles. Most of the adapted streets do not have proper pavements and walk ways for the slow speed pedestrian traffic. Therefore, lack of traffic separation is evident in most parts of the city, and lack of pavements, the non-motorized are forced to share the same space with vehicles. Pedestrians in Dar es Salaam city are observed to cross the road wherever they wish and this practice places them at a higher risk of being hit by a vehicle when walking on the roads.

Dar es Salaam city is overpopulated. The population density is 3133 and the vehicle population density is 718. These densities are quite high compared to the land size capacity of the city. The physical space of the city has no balanced proportion between populations (people and vehicles) and the infrastructure. This situation has led to several risk taking behaviours. For instance 1) In peak hours, vehicles tend to use pedestrian roads to avoid high traffic jams which is illegal to drive,

and the risk of nocking a pedestrian is very high especially children. 2) Passengers of the public transport tend to opt for the motor bikes as an alternative to fast transport, this means of transport (famous as Boda boda) is very unsafe, passengers are overloaded (three passengers occupying a space for one) and no use of helmet to protect passengers (against head injury) in case of an accident. Due to its small size, riders of motorcycles violate several traffic rules, including the use of pedestrian roads, and crossing red lights. 3) It is also observed that, when a traffic jam is completely still, some vehicles tend to use the opposite lane, and this increases the chances of a head-on collision.

In Shinyanga (rural areas), spaces are more open, and the speed limits are high in most areas. In some centres of the villages, roads are just marked as 50k/h zone or end of 50k/h zone. Therefore, most drivers tend to increase speed after crossing the 50k/h zone. Due to high speed facilitated by the environment, both crash and injury risk in rural areas differ from those on urban roads. There are higher crash rates in Dar es Salaam (because of the greater number of intersections and higher traffic volumes). Few crashes in Shinyanga tend to be more severe (because of the greater speeds and diversity of road conditions). Most accidents are fatal. In some villages, there are no road signs; drivers are often presented with misleading information or no advance warning. The key contributing elements to the increased severity of rural crashes compared to urban crashes include higher operating speeds, hazardous roadsides, and generally poorer road geometry and lower enforcement levels.

6.6 Summary

The objective of this chapter was to 1) examine a set of factors that can be used to explain risk taking behaviour of Tanzanian public on traffic, 2) to examine their variation effects by geographical areas and 3) to provide information that can contribute to a deeper understanding about the reasons of their association with risk taking behaviour.

The analysis revealed that; 36.8% of the variance in risk taking behaviour of Tanzanian public associated with traffic accidents is explained by the contribution of 1) risk attitude, 2) religious belief, 3) risk willingness and 4) geographical area.

The factor religious belief (My religion affects how I behave in traffic) had a greater effect on risk taking behaviour compared to other explanatory factors.

The pattern of effect of factors influencing hazardous behaviour has also revealed a spatial variation within geographical areas (urban, semi-urban and rural). Risky attitudes are more attributed to risk taking behaviours in rural areas than in urban and semi urban areas.

A peculiar finding in this analysis is about the factor religious belief. The factor religious belief indicated a significant effect to risk taking behaviour in each geographical areas. However, this factor was analysed based on a single item, which could also mean lower validity than composite measured variables. This demanded further analysis; first to examine whether the observed relationship between religious belief and risk taking behaviour is explained by mediation or spurious factors and secondly to explore more qualitative information about the association. Results indicated that, the association between religious belief and risk-taking behaviour is a direct link. The amount of innate characteristics given by the trivariate factors was too little to undermine its direct effect. Qualitative analysis revealed three forms of association between religious belief and risk taking behaviour; 1)) in the form of culture in which religious norms and values are used to provide codes on how people should accommodate anxieties related to traffic risk and reconciliation to the consequences of accident risk. 2) in the form of civil societies, in which religious organisations play varying roles in setting moral and behavioural standards to the public (e.g. they own schools and teach road safety as part of syllabus. 3) in the form of ritualised practices, in which religious people feel protected by the spirit of their almighty father by using ritualised symbols such as rosary, tasbee and sometimes biblical or Koran quotations stamped on their vehicles.

The analysis has revealed a significant correlation between risk attitude and risk taking behaviour. People who post positive attitude towards traffic rule violation perform more risky behaviours in traffic than those with negative attitudes towards traffic rule violations. In addition, risky attitude is more attributed into risky behaviour in rural areas than in urban and semi-urban areas.

The analysis has also revealed a positive correlation between risk willingness and risk taking behaviour. People with high degree of willingness to take risk in traffic also perform more risky behaviours associated with road traffic accidents. In addition relative poverty and corruption have been identified as genuinely important stimulus of individuals and the government to develop

consent of risk taking behaviour associated with traffic accidents in Tanzania (for instance, drivers were willingly to violate traffic rules, with a notion that they can simply bribe traffic police).

Lastly, the analysis revealed a significant effect and positive correlation between risk taking behaviour and geographical area. Urban spaces in Tanzania signify more chances of risk taking behaviour associated with road traffic accidents (geographical area (Urban=reference category)). The question why Tanzania as an independent geographical area is linked to high risk taking behaviour associated with traffic accidents, relative location of the country was identified as one explanatory factor. Tanzania is relatively located within South of Sahara Region. These are low-income countries experiencing high system risk, high number of accident causalities, lack of effective enforcement, corruption, risk culture etc. The overall economic situation of the countries located in south of Sahara Region can probably be interpreted that; due to economic challenges (poverty, lack of resources and inefficient organization), the authorities in these countries may lack enough economic resources to maintain and establish road safety measures compared to countries with high income countries located relatively as Northern countries.

In addition, Tanzania by geographical areas (urban, semi-urban and rural) also has revealed a varying degree of physical and social cultural environment contributing to risk taking behavior.

- *Business and traffic exposure*, mobility demand force in urban areas has rapidly increased the population of the vehicles in Tanzania, and the country has not managed to provide sufficient infrastructures and safety policies to accommodate safe mobility of both motorized and non-motorized. Hence, high risk taking behavior associated to traffic accidents in urban areas.
- *Gender, religion and traffic exposure.* The cultural norms (including religion values) in Tanzania (applied in all geographical areas) regard driving and travelling activities as more masculine relevance than feminine. Gender stereotypes regarding traffic related occupations are characterized as typically masculine activities. Therefore, there are more males, (almost all) driving public buses and commercial trucks or Lories, and women are more visible as passengers in private cars or driving private cars. Therefore, male attitudes towards rule violation is identified to be very high compared to women, and attitudes are found to be a strong predictor of behaviour, this might also imply that urban driving in

Tanzania contains more risk taking behaviour due to the high number of male drivers in the areas.

- *Education and traffic exposure*, In Tanzania, skilled people are predominately located in urban areas, and this is due to the labour market demand. They are well paid and able to own private cars. They occupy regular jobs, which demand that they travel more than those with unstable or no occupation. This situation in a way can partly explain the high congestion of traffic in Dar es Salaam city especially at peak hours, also their risk taking behaviour due to context of the environment they live and work in.
- *The physical environment,* in urban areas, the co-existence of high-speed motor traffic and low-speed pedestrian traffic is very critical for accidents especially in areas of intense pedestrian traffic like commercial areas, bus stops, parks and schools. The street systems have been constructed and adapted to allow for greater mobility of automobiles in space, implying high average speeds for vehicles. Most of the adapted streets do not have proper pavements and walk ways for the slow speed pedestrian traffic. Therefore lack of traffic separation in most parts of the urban areas in Tanzania, influence the non-motorized to share the same space with vehicles. This also signifies risk-taking behaviours in urban areas.

CHAPTER SEVEN

Summary and conclusions of the study

7.0 The study

The present study has specifically investigated; 1) the underlying pattern and tendencies of risk perception, risk attitudes, risk willingness and risk taking behavior of the Tanzanian public in road traffic by geographical areas (i.e. urban, semi urban and rural), by gender division (i.e. males and females) and by relevant age groups of experience and likely risk taking behaviour. 2) The important factors contributing to risk taking behaviour of the Tanzanian public in road traffic when experiencing different levels of system risk (i.e. urban, semi-urban and rural traffic), and 3) the extent that such factors are attributed to contextual conditions in each type of geographical area and to compositional condition.

The analysis of risk perception, risk attitude, risk willingness and hazardous behaviour was to examine the judgements people make when they are asked to characterize and evaluate the danger of road traffic accidents. This is to aid risk analysis and policy-making by providing a basis for understanding and anticipating public responses to traffic hazards and improving the communication of risk information among lay people, technical experts, and decision-makers. This specific objective assumes that those who promote and regulate public health and traffic safety need to understand how people think about and respond to traffic risk. Without such understanding, well-intended policies may be ineffective. This will also add knowledge in understanding how people experiencing different levels of system risk (urban traffic, semi-urban traffic and rural traffic) in Tanzania, perceive and understand traffic risk, how they behave in traffic as well as their priorities and decisions towards traffic safety measures within their locality.

The analysis of factors influencing risk-taking behaviour was to identify and examine a set of factors that can be used to explain risk-taking behaviour of Tanzanian public on traffic. This information will make a contribution to road safety authorities and other stakeholders to understand which attitudinal and behavioural dimensions that could be targeted by human factor campaigns in Tanzania and specifically at different geographical areas within the country. This analysis is based on the fact that; more than 80% of the factors contributing to traffic accidents in

Tanzania are associated with human factor. However, there are multiple factors interaction between human behaviour, road environment and characteristics of the vehicle.

The results of this study can also be utilised as a baseline data in future related researches. Currently, there is a potential shortcoming in the literature regarding risk perception, risk attitudes, risk culture, risk willingness and risk taking behaviour associated with traffic accidents in Tanzania.

This study was organised and conducted under the principles and ethics within a discipline of human geography. Human geography shades into both natural science and humanities. As such the study has shared many of the approaches used by other social sciences, and faced similar underlying philosophical methodology such as naturalism, realism, behaviourism and Marxism to the study of road traffic accidents. What makes this study geographical, is the application of spatial relationship (traditionally man-environment relations) approach, or the use of space and place concepts in understanding the distribution in occurrence of road traffic accidents, its impact, improved safety strategies, the variations according to geographical scales and the extent to which traditional solutions may or may not reduce the level of road accidents.

Four theoretical approaches with relevance to geographical perspectives were used: 1) system approach guided by a model of safe traffic system, 2) risk theory and cultural approach, 3) political ecology approach and 4) modernization approach. Explanations of system approach to the study of road traffic accidents were based on man-environment adjustments and maladjustments. A model for safe traffic system presented a set of interacting units (safe vehicle, safe road environment and safe road user behaviour as major components of the system, along with engineering effect and system of traffic rules, control and regulations) that form an integrated whole (group cohesion) designed for understanding the mechanism of safe traffic system. Risk perception and the relation between risk judgments and decision under uncertainty of road traffic accidents were guided by risk theory. Traffic risk beliefs, degree of worry for road traffic accidents and the degree for risk taking and risk tolerance behaviour were guided by cultural approach. Political ecology approach was focused on the relevance of political and economic factors in combating the problem of traffic accident. In addition, the modernization approach was linked to

increased auto-mobility including a demand for privately owned automobiles regardless their side effects.

The methodology of the study was based on triangulation approach. Data collection methods involved a questionnaire survey, interviews with both key and primary informants, focus group discussion with local authorities, and observation. In the analysis; 1) the reliability and the validity of the measure instrument in a survey data were examined by a set of statistical techniques; this included exploratory factor analysis. 2) Both MANOVA and ANOVA, along with descriptive statistics and post-hoc test were used to compare means of risk perception, risk attitudes, risk willingness and risk taking behaviour by geographical areas, gender and age group. 3) Step wise linear regression analysis was used to select the best-fit model in explaining risk-taking behaviour of Tanzanian public on traffic. 4) A four-step data analytic method by Baron and Kenny was used to examine mediation effect of factors. 5) Contextual as well as content analysis techniques were used to analyse the transcribed interviews with lay people as well as experts and other key informants.

7.1 Results

7.1.1 Specific objective number one

The main quest for specific objective number one was to find out; is there a significant difference in subjective risk judgement related to traffic accidents between people experiencing different levels of system risk in Tanzania? The hypothesis was based on the argument that: People living in areas experiencing different levels of system risk (such as urban, semi-urban and rural areas) can also perceive and behave differently on traffic related risk in Tanzania. This generally aimed to examine the importance of physical and social cultural environment (space and place) in subjective judgment that people make about the characteristics and severity of risk related to traffic accidents.

Four analysis were performed;

- The first analysis was to examine whether geographical areas (context of urban, semi-urban and rural areas) can make a difference in risk perception, risk attitude, risk willingness and risk taking behaviour of road users in Tanzania.

- The second analysis was to examine whether gender division (males and females) within a specific area (either urban, semi-urban or rural) can make a difference in risk perception, risk attitude, risk willingness and risk taking behaviour of road users in Tanzania.
- The third analysis was to examine whether age- group within a specific area can make a difference in risk perception, risk attitude, risk willingness and risk taking behaviour of road users in Tanzania
- The fourth analysis was based on a three levels of stratification: geographical area, sex and age group. This intends specifically to check the significance of subgroups, which influence the general significance of the main variable.

Results

1. Risk perception, risk attitude, risk willingness and risk taking behaviour by geographical area.

MANOVA was used to compare mean values for risk perception, risk attitude, risk willingness and risk taking behaviour by Geographical area (urban, semi-urban and rural)
The results generally revealed a strong overall significant effect of geographical areas in risk perception, risk attitudes, risk willingness and risk taking behavior of Tanzanian public on traffic.

- People living in urban and semi-urban areas perceive lower risk of man-made related dangers associated with road traffic accidents than those living in rural areas
- The attitude towards rule violation is higher in rural areas than in urban and semi-urban areas. This could also mean that, people living in rural areas have positive attitude towards rule violation.
- The tendency of over speeding and risk driving is higher in rural areas and it indicates to be slightly lower in semi-urban and urban areas.

In addition, there was no significant difference between urban and semi urban areas in terms of road users risk perception, risk attitude, risk willingness and risk taking behavior. The context of physical and social cultural environment in urban and semi-urban areas in Tanzania seems to be similar. This could also mean that; semi-urban traffic environment in Tanzania is more relating to urban traffic environment than rural traffic environment.

2, Risk perception, risk attitude, risk willingness and risk taking behaviour by gender and geographical area.

ANOVA was used to compare mean values for risk perception, risk attitude, risk willingness and risk taking behaviour by Geographical area and gender. The curiosity of this analysis was to examine whether gender division (males and females) within a specific geographical area (either urban, semi-urban or rural) can make a difference in risk perception, risk attitude, risk willingness and risk taking behaviour of road users in Tanzania.
The results revealed that:

Males living in urban areas perceive sex and drug related dangers lower than males living in semi-urban and rural areas.

- The attitude towards rule violation for males living in rural areas is higher than males living in urban and semi-urban areas.
- Dimensions for risk willingness and risk taking behaviour do not become significant if gender (males and females) is adjusted within the geographical areas (urban, semi-urban and rural areas)
- Females appeared non-significant in all dimensions for risk perception, risk attitude, risk willingness, and risk taking behaviour, when gender (males and females) is adjusted within geographical areas (urban, semi-urban and rural areas).

3, Risk perception, risk attitude, risk willingness and risk taking behaviour by age group and geographical area.
ANOVA was used to compare mean values for risk perception, risk attitude, risk willingness and risk taking behaviour by geographical area and age group. The curiosity of this analysis was to examine whether age- group within a specific area can make a difference in risk perception, risk attitude, risk willingness and risk taking behaviour of road users in Tanzania. The results revealed that:

- The attitude towards rule violation for the age group 16-19years in rural area is higher than in urban and semi-urban areas.

- The attitude towards rule violation for the age group 20-24years in rural area is higher than in urban area.
- The tendency of speeding and risky driving for the age group 25-34 years is lower in rural area than in urban area
- The attitude towards rule violation for the age group 35-44years in rural area is higher than in urban and semi-urban areas.
- Risk willingness regarding signs and symbols for age group 35-44years in rural area is higher than in semi urban area.
- The tendency of speeding and risky driving for the age group 35-44 years is higher in rural area than in urban area
- The attitude towards rule violation for the age group 45+ years in rural area is higher than in urban and semi-urban areas.
- The tendency of slowing down due to pedestrian and darkness for the age group 45+ in semi urban area is higher than in rural areas.
- The tendency of slowing down due to danger condition for the age group 45+ in rural area is lower than in urban and semi urban areas.

4, Risk perception, risk attitude, risk willingness and risk taking behaviour by gender, age group and geographical area.

ANOVA was used to compare mean values for risk perception, risk attitude, risk culture and risk taking behaviour by geographical area, gender and Age group. This analysis was based on a three levels of stratification: geographical area, gender and age group. This intended specifically to check the significance of subgroups, which influence the general significance of the main variable.

The general overview of the results, portrayed similar pattern and tendency compared to results in analysis two and three. What is interesting is that, when the geographical areas were controlled by gender, females were seen not significant, and when the analysis is based on three levels of stratification (geographical areas, gender and age group) gender difference especially females groups are eventually becoming significant.

- The attitude towards rule violations by females aged between 16-19 years in rural area is higher than females of the same age in urban and semi-urban areas.

Interpretation of the results.

Perception related to manmade danger indicated to be lower in urban and semi-urban areas and higher in rural areas. It could be that in urban and semi-urban areas people experience high system risk such as several traffic accidents with minor injuries and minor property damages, while manmade dangers such as robbery are more threatening to their life than traffic accidents. Therefore, more worries are placed to manmade dangers than traffic related risk. Theoretically, when people are exposed to high number of different risk source, they may choose to priorities risks perceived as more threatening rather than what is perceived as common and low related risks.

In addition, it might be that, urban and semi-urban communities in Tanzania are perceived as societies that are more modern and it implies their social and economic transformations of society in the explanation of proneness to road traffic accidents and mitigation measures. This is also linked with increased mobility owned means of transport including demand for privately owned means of transport. Therefore, the tendency of neglecting traffic risk in urban and semi-urban areas might imply the tolerance of development risk. Theories suggest that: traffic accidents, which occur in modernized societies, are an inevitable cost of the development process itself. In any case, the costs of traffic accidents are always outweighed by the benefits of increased motorization and, they can be tolerated and perceived as low risk.

On the other side, the explanation why people living in rural areas perceive high risk in road traffic accident could be due to accidents tendencies and impact they normally experience. Their subjective risk judgments could relate to emotions such as worry of the impact they normally experience. In rural and sparsely populated areas, experience less total number of accidents and more severe accidents (fatal crashes and a higher death rate). Due to the severe impact of road accidents in rural areas, rural people will develop more worries than urban people will. Road accident related worry might be defined as the levels of concern that people experience when they think about the impact of being involved in an accident.

Spatial variation of risk attitude and risk taking behaviour indicates a similar pattern and tendency experienced between urban and semi-urban vs rural areas. Attitude towards rule violation is more in rural areas than in urban and semi-urban areas, likewise risk taking behaviour particularly over speeding is more wide spread in rural than in urban or semi urban areas in Tanzania. This pattern complements the findings of several studies in developed countries. Theoretically, attitudes are considered as strong predictors of behaviour. However, the differences in the frequencies of severe accidents, rule violation and willingness to take traffic risk between rural and urban areas could be explained by differences in physical and social cultural environment such as road infrastructure, settlement pattern, traffic regulations, and enforcement mechanisms embedded on geographical areas. Roads invited to less speeding, such as urban roads with speed limit under 60mph, usually predicts reduced risk of causalities and risk taking behaviour such as over speeding and unnecessary overtaking. The attitude towards traffic rule violation and risk taking behaviour could probably be associated with traffic culture of a place. Traffic culture in urban areas is composed by tight rules and regulations, well-defined traffic systems with road signs, markings and strong enforcements. In rural areas, traffic culture often lack traffic regulations in their road systems, and the enforcement of such traffic systems is scant. Theoretically, an area tightened by well-defined traffic regulations and strong enforcement is expected to contain people with low risk culture associated to traffic accidents. This might probably imply why people living in rural areas exhibit more risk culture of risk taking behaviours associated with traffic accidents than in urban and semi-urban areas in Tanzania.

On the other side, the differences in economic levels of geographical areas (high in urban and semi-urban and low in rural area) can also inform traffic culture of a place. Other studies found that; areas with low economy implicate low safety motivation and people with low socio-economic status were found to be risk takers. These results can also inform why people living in rural areas exhibit high-risk attitudes and high tendency of risky driving in Tanzania. Absolute poverty is more exerted and experienced in rural areas in Tanzania.

7.1.2 Specific objective number two

Specific objective number two was to 1), examine a set of factors that can be used to explain risk taking behaviour of the Tanzanian public in traffic. 2) To examine their variation effects by

geographical areas and 3), to explore qualitative information that can contribute to a deeper understanding about the reasons of the association between identified factors and risk taking behaviour.

The results revealed that; 36.8% of the variance in risk taking behaviour of Tanzanian public associated with traffic accidents is explained by the contribution of 1) risk attitude, 2) religious belief, 3) risk willingness and 4) geographical area.

The factor religious belief (My religion affect how I behave in traffic) had a greater effect on risk taking behaviour compared to other explanatory factors.

When the explanatory factors were examined by geographical areas (urban, semi-urban and rural), results revealed a significant spatial variation effect of the factors;

- In urban areas, 13.8% of the variance in risk taking behaviour was explained by two factors, religious belief and risk willingness. The factor religious belief had a greater effect to risk taking behaviour.
- In semi-urban areas, 18.8% of variance in risk taking behaviour was explained by only one factor, religious belief.
- In rural areas, 72% (very high degree of explanation) of the variance in risk taking behaviour was explained by only two factors: religious belief and risk attitude. Risk attitude had a greater effect to risk taking behaviour than religious belief

The overall observation of the findings indicated that: Geographical area is one among important factors to be taken into account when determining the magnitude of effect of factors influencing risk-taking behaviour. Risky attitudes were more attributed to risk taking behaviours in rural areas than in urban and semi urban areas.

A peculiar finding was about the factor religious belief. The factor religious belief indicated a significant effect to risk taking behaviour in each of the geographical areas. However, this factor was analysed based on a single item, which could also mean lower validity than composite measured variables. This demanded further analysis to examine whether the observed relationship between religious belief and risk taking behaviour is explained by mediation or spurious factors. Results indicated that, the amount of innate characteristics given by the trivariate factors (risk

attitude, risk willingness and inner voices) identified to mediate the association between religious belief and risk taking behaviour was too little to undermine its direct effect.

Explored reasons of the association between factors and risk taking behaviour

Qualitative data was explored to provide deep understanding about the reasons and association between the explanatory factors and risk taking behaviour. Three forms of association between religious belief and risk taking behaviour were qualitatively revealed; 1) in a form of culture in which religious norms and values are used to provide codes on how people should accommodate anxieties related to traffic risk and reconciliation to the consequences of accident risk. 2) in a form of civil societies, in which religious organisations play varying roles in setting moral and behavioural standards to the public (e.g. they own schools and teach road safety as part of syllabus). 3) in a form of ritualised practices, in which religious people feel protected by the spirit of their almighty father by using ritualised symbols such as rosary, tasbee and sometimes biblical or Koran quotations stamped on their vehicles.

The association between risk attitude and risk taking behaviour was identified through road users' observed actions on traffic. Positive attitude towards traffic rules and regulations was related to when road users behave properly in traffic and negative attitude towards traffic rules and regulations by improper behaviours on traffic. Drivers especially men were identified to exhibit negative attitudes towards low speed (Men are always speeding and overtaking unnecessarily in Tanzania), pedestrians and drivers have a negative attitude to the road signs especially zebra crossing in Tanzania. Drivers do not stop at zebra crossings, and pedestrians tend to cross wherever they wish, no matter how close a zebra crossing is. Most drivers are impatient whilst waiting for the green light, and this is much more evident at night when police are not available. In general, a person who has positive attitudes towards traffic rules and regulations (such as speed limits, road signs, etc.) is considered to be one who can use roads safely in any role a person is assuming (e.g. as a driver, pedestrian, cyclist, etc.). In much the same way, a person who displays negative attitudes towards traffic regulations will accordingly drive unsafely. Attitude of road users is manifested in the way they behave in traffic. In general, if road safety interventions have to be implemented in Tanzania, it might be relevant to focus more on attitude factors to improve traffic behaviour.

The association between risk willingness and risk taking behaviour associated with traffic accidents were qualitatively related to poverty and corruption. These two factors were identified as a genuinely important stimulus of individuals and the government to develop a consent of risk taking behaviour associated with traffic accidents in Tanzania. For instance, drivers were willing to violate traffic rules simply because they can cheaply pay a bribe to traffic police. In addition, the majority of Tanzanians cannot afford to purchase brand new cars, which are well equipped with safety devices (due to existing poverty); they can only afford second hand cars, which could be almost worn out and unsafe. This finding to some extent is contrary to most studies in developed countries. In developed countries, sensation seeking and excitement seeking are considered important stimulus to measure people's willingness to take risks or engage in hazardous behaviour. In Tanzania and perhaps many other developing countries, the degree of willingness to engage into risky driving behaviour or hazardous behaviour in traffic is more associated to economic factors than sensation-seeking or excitement-seeking.

Lastly, the analysis revealed a significant effect and positive correlation between risk taking behaviour and geographical area. In this case, geographical area was referred as a country in general and as an urban area (reference category). The question why Tanzania as an independent geographical area is linked to high risk taking behaviour associated with traffic accidents, relative location of the country was identified as one of the explanatory factors. Tanzania is relatively located within south of Sahara region. These are low-income countries experiencing high system risk, high number of accident causalities, and lack of effective enforcement, corruption, and risk culture. Due to economic challenges (poverty, lack of resources and inefficient organization), the authorities in these countries lack enough economic resources to maintain and establish road safety measures compared to countries with high income countries located relatively as northern countries.

Tanzania by geographical areas (urban, semi-urban and rural) also has a varying degree of physical and social cultural environment contributing to risk taking behavior. Urban spaces in Tanzania signify more chances of risk taking behavior associated with road traffic accidents (urban as a reference category).

- Auto-mobility demand force in urban areas has rapidly increased the population of the vehicles in Tanzania, and the country has not managed to provide sufficient infrastructure

and safety policies to accommodate safe mobility of both motorized and non-motorized. Hence, high risk taking behavior associated with traffic accidents in urban areas.

- The cultural norms (including religion values) in Tanzania (applied in all geographical areas) regard driving and travelling activities as more masculine relevance than feminine. Gender stereotypes about traffic related occupations is characterized as typical masculine activities. Therefore, there are more males (the majority) driving public buses and commercial trucks or Lorries, and women are more visible as passengers in private cars or driving private cars. Therefore, male attitudes towards rule violation is identified to be very high compared to women, and attitudes are found to be a strong predictor of behaviour in traffic. This might also imply that urban driving in Tanzania contains more hazardous behaviour, due to the higher number of male drivers in these areas.
- Skilled people are more located in urban areas, and this is due to labour market demand. They are well paid and capable to own private cars. They hold regular jobs, which demand them to travel more than those with unstable or no occupation. This situation in a way can partly explain high congestion of traffic in Dar es Salaam city especially at peak hours, and their risk taking behaviour due to context of their environment they live and work.
- In urban areas, the co-existence of high-speed motor traffic and low-speed pedestrian traffic is very critical for accidents especially in areas of intense pedestrian traffic like commercial areas, bus stops, parks and schools. The street systems have been constructed and adapted to allow for greater mobility of automobiles in space, implying high average speeds for vehicles. Most of the adapted streets in Tanzania do not have proper pavements and walk ways for the slow speed pedestrian traffic. Therefore lack of traffic separation in most parts of the urban cities in Tanzania, influence the non-motorized to share the same space with vehicles. This also signifies risk-taking behaviours in urban areas.

In general, 36.8% of risk taking behaviour of Tanzanian public on traffic is explained by factors related to their religious beliefs, their risk attitudes, their risk willingness and their environment in which they live. 72% of risk taking behaviour of people in rural traffic is explained by factors relating to their risk attitude and their religious beliefs. This generally informs that, religious organisations have a significant role to play in road safety strategies in Tanzania. There is a need of recognising religious organisations as one of the important road safety stakeholders in Tanzania.

7.1.3 Recommendations

Traffic related risk is perceived to be low in urban and semi-urban areas in Tanzania. This implicate low public demand for reducing the risk and less priority by the authority to improve traffic safety including poor allocation of resources. In order to sensitise Tanzanian public and bring awareness to the problem of road accidents, two strategies are suggested; 1) short-term measures, which can be introduced immediately, and 2) long-term measures, which are no less important but take more time both to implement and to bring about the desired results.

- The short-term measures include; first, the determination of road safety programs as a target (mission) to achieve specific objectives in the country, second is to engage in large-scale information campaigns (road safety campaigns) based on the objectives set to be achieved at different programs in relation to the needs of specific geographical areas (urban, semi-urban or rural).
- In the longer term (strategic measures), first is the determination of road safety vision in the country (description of a desirable safety state in the future). Safety awareness should begin from childhood, as it is difficult to impart awareness to grown up people. If safety awareness is impressed at childhood, safety will become a habit. Therefore 1) road safety education should be included as a part of the school curriculum; this will enable children and youngsters to be familiar with safety knowledge from the beginning. 2) Video and computer games that simulate motor racing should be banned by law, or discouraged by parents, as it will develop a racing habit in children. Films and TV serials showing racing, at high speed / highly risky riding, driving by heroes should not be shown. Children and youngsters are likely to imitate the same, and may cause accidents in the future. 3) Road safety projects should be made compulsory in primary and secondary schools, experts should be involved for motivating children. This will encourage children and youngsters to be part of road safety stakeholders and become responsible.

36.8% of the variance in risk taking behavior associated with traffic accidents in Tanzania is explained by the contributions of 1) risk attitude, 2) religious belief, 3) risk willingness and 4) geographical area. The majority of people, specifically male drivers, were identified to contain positive attitude towards traffic rule violations and performed more hazardous behaviours in traffic than those with negative attitudes towards traffic rule violations. Risk attitude correlate positively

with risk taking behaviour in Tanzania. This means, if hazardous behaviour has to be changed in Tanzania; countermeasures should focus more on attitude traits. Therefore, in order to internalise positive attitude towards safety behaviour in Tanzania, there is a need of revising the current procedure for driver training and transform it to professional standards. Given the situation that, Tanzania has no national syllabus or curriculum for the driver training. There is a need therefore:

- A well-defined national driving curriculum to be established.
- Introduce both practical and theoretical test and, if passed, then a driving licence.
- Introduce a multiphase approach in driver training, involving mandatory training both before and after the driving test.
- To establish standards for driver education which can enable learner drivers not only to learn to master their vehicle, and to be familiar with traffic regulations, but also to learn how to assess risks and risk-increasing factors in road traffic as well as to be a good judge of their own skills and limitations.
- There is a need for defining by law what it means to be a driving school, and what are the parameters and ethics for training a driver.
- Ensuring that professional driving instructors have the knowledge and pedagogical skills necessary to guide and assist the candidate towards becoming a safe driver, driver trainers should be able to coach and not simply instruct.
- Penalties for driving offences should focus more on rehabilitation rather than fining. Drivers who have been driving under the influence of alcohol or drugs, exceeding the speed limit, aggressive and dangerous driving, they mostly need rehabilitation activities than paying a penalty fee.

People with strong beliefs in their religion have low risk taking behaviours compared to people with moderate or no beliefs in Tanzania. In order to take into account the importance of religious values and norms in developing road safety counter measures. It is advised that; religious organisations should first be recognised as one of the potential stakeholders in changing risk-taking behaviour associated with road traffic accidents in Tanzania. The government should effectively use religious social network to disseminate road safety information. This will significantly reach majority of people especially those in rural areas. For instance, the government can set road safety targets and religious leaders can effectively disseminate information through 1) funeral ceremonies

of the accident victims, 2) religious conferences, 3) schools owned by Missionaries, 4) hospitals owned by missionaries, and 5) religious charity organisations. Religious values and norms have been identified to contribute largely to attitude traits attributing to safe traffic behaviour.

7.1.4 Conclusion

The geographical context of urban-rural differences in Tanzania play a significant role in analysing road user behaviour. Road users in Tanzania perform or reproduce behaviours that are themselves a product of the relationship between their local environment and traffic related technology in traffic system that surrounds them. Geographical spaces of culturally related beliefs are significant predictors of driving behaviour in Tanzania. That is to say, the likelihood for an individual or a group to engage in risky or safety behaviour on road traffic is largely predicted by belief related factors in Tanzania.

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APPENDICES

Appendix 1: Questionnaire used for Data collection (English Version)

Survey on Cross-Cultural Perspectives on Traffic Safety

INTRODUCTION

The main goals of this project are to conduct cross-cultural comparisons of attitudes and behaviour related to traffic and traffic safety. Equivalent research is currently going on in several countries. We want everyone to answer this questionnaire, also those who do not have a driving license. By answering this questionnaire you are providing valuable information concerning traffic safety.

THE STUDY IS CONDUCTED BY

The study is carried out by the Norwegian University of Technology and Science (NTNU) in collaboration with the University of Ghana, Christ College in India, Beijing Normal University and Southwest China Normal University in China and St Petersburg State University in Russia. The study is conducted under the supervision of Professor Torbjørn Rundmo at NTNU.

CONFIDENTIALITY

All information is kept confidential. During data analysis it will not be possible to identify which individuals answered this or that questionnaire. Participation in the survey is voluntary.

SURVEY ANSWERS

There are no correct or incorrect answers in this survey. We are interested in your point of view and honest opinions concerning traffic safety. It is important to answer all questions, but if there are questions you cannot or do not want to answer, please proceed to the next question. Return the survey in the accompanying envelope.

QUESTIONS CONCERNING THE SURVEY?

If you have any questions concerning the survey you can contact Professor Torbjørn Rundmo by telephone +47 73 59 16 56.

It takes about 30 minutes to complete the survey. Please note that there are questions on both sides of the sheet!

Thank you for participating!

Torbjørn Rundmo
Professor
Department of Psychology, NTNU

Stig Jørgensen
Associate professor
Department of Geography, NTNU

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PLEASE READ THIS BEFORE YOU START.	This form will be machine-read. Please follow these instructions: • *Use a black or blue ball-point pen.* • *Write as clearly as you can, and do not write outside the boxes.* • *Mark check boxes like this: ☒. If you mark the wrong box, please fill it completely, like this: ■ Then mark the correct box.* • *Please do not copy this form. Originals are needed for accurate machine reading.* • *Mark only one box per question unless otherwise indicated.*

1. My Opinions about Traffic Safety

To what extent do you agree or disagree with these statements about traffic and driving in general?

One mark on each line.	*Strongly agree* 1	2	*Neither /nor* 3	4	*Strongly disagree* 5
1. To maintain flow in traffic, one must ignore several traffic regulations	☐	☐	☐	☐	☐
2. It makes sense to increase speed to drive past cars which are driving too slowly	☐	☐	☐	☐	☐
3. One should respect traffic regulations, independently of driving conditions	☐	☐	☐	☐	☐
4. It is reasonable to ignore red lights when there are no other cars or people in sight	☐	☐	☐	☐	☐
5. Drivers who violate traffic regulations don't represent a larger threat for safety than those respecting these regulations.	☐	☐	☐	☐	☐
6. Traffic regulations are overcomplicated, and therefore difficult to comply with when driving	☐	☐	☐	☐	☐
7. If a pedestrian is run down by a car, the pedestrian is to blame	☐	☐	☐	☐	☐
8. If you are a decent driver it's acceptable to drive a bit faster	☐	☐	☐	☐	☐
9. There should be severe sanctions for driving too fast	☐	☐	☐	☐	☐
10. In the absence of other good alternatives, I would let an unsafe driver drive me home	☐	☐	☐	☐	☐
11. If my friends were passengers of an unsafe driver, I would join them	☐	☐	☐	☐	☐
12. I feel it's my responsibility to tell a driver if he/she is driving too fast	☐	☐	☐	☐	☐
13. I would never drive after alcohol consumption	☐	☐	☐	☐	☐
14. I would never let a drunk driver take me home, if I knew they had consumed alcohol	☐	☐	☐	☐	☐
15. There should be severe sanctions for hitting pedestrians with a car	☐	☐	☐	☐	☐
16. Driving after dark should be avoided in respect of traffic safety	☐	☐	☐	☐	☐
17. I have good knowledge of traffic rules.	☐	☐	☐	☐	☐
18. Pedestrians have a large responsibility making sure they are not hit by cars	☐	☐	☐	☐	☐
19. Drivers are often powerless faced with unpredictable pedestrians	☐	☐	☐	☐	☐

Before you continue: Please ensure that you have answered all questions on this page.

2. My risk judgment in traffic

1. How probable is it that you would be injured due to the following events?

One mark on each line.	*Very high probability* 1	2	*Neither/ nor* 3	4	*No probability* 5
1. My car running off the road	☐	☐	☐	☐	☐
2. Head on collision	☐	☐	☐	☐	☐
3. Collision with another vehicle from behind	☐	☐	☐	☐	☐
4. Collision caused by changing driving lane	☐	☐	☐	☐	☐
5. Collision with a pedestrian	☐	☐	☐	☐	☐
6. The vehicle overturns in the roadway	☐	☐	☐	☐	☐
7. Collision with an animal	☐	☐	☐	☐	☐
8. A parking accident	☐	☐	☐	☐	☐
9. As a driver of a motor vehicle	☐	☐	☐	☐	☐
10. As a rider of a bicycle	☐	☐	☐	☐	☐
11. As a pedestrian	☐	☐	☐	☐	☐
12. As a passenger of a motor vehicle	☐	☐	☐	☐	☐

2. If any of these accidents should happen to you, how severe would the consequences be?

One mark on each line.	*Very severe /fatal* 1	2	*Neither /nor* 3	4	*Very minimal* 5
1. My car running off the road	☐	☐	☐	☐	☐
2. Head on collision	☐	☐	☐	☐	☐
3. Collision with another vehicle from behind	☐	☐	☐	☐	☐
4. Collision caused by changing driving lane	☐	☐	☐	☐	☐
5. Collision with a pedestrian	☐	☐	☐	☐	☐
6. The vehicle overturns in the roadway	☐	☐	☐	☐	☐
7. Collision with an animal	☐	☐	☐	☐	☐
8. A parking accident	☐	☐	☐	☐	☐

3. My judgement of other risks

1. How probable is it that you personally should experience the following hazards?

One mark on each line.	*Very probable* 1	2	*Neither /nor* 3	4	*Very low probability* 5
1. Handguns	☐	☐	☐	☐	☐
2. Knives	☐	☐	☐	☐	☐
3. Aviation	☐	☐	☐	☐	☐
4. Police razzia	☐	☐	☐	☐	☐
5. Motor vehicles	☐	☐	☐	☐	☐
6. Hunting	☐	☐	☐	☐	☐

Before you continue: Please ensure that you have answered all questions on this page.

One mark on each line.	*Very probable* 1	2	*Neither /nor* 3	4	*Very low probability* 5
7. Swimming	☐	☐	☐	☐	☐
8. Contraceptives	☐	☐	☐	☐	☐
9. Sports	☐	☐	☐	☐	☐
10. War	☐	☐	☐	☐	☐
11. Terrorism	☐	☐	☐	☐	☐
12. Weapons of mass destruction	☐	☐	☐	☐	☐
13. Storms	☐	☐	☐	☐	☐
14. Landslides	☐	☐	☐	☐	☐
15. Floods	☐	☐	☐	☐	☐
16. Fires	☐	☐	☐	☐	☐
17. Poverty	☐	☐	☐	☐	☐

2. How probable is it that you personally should experience a health injury due to the following hazards?

One mark on each line.	*Very probable* 1	2	*Neither /nor* 3	4	*Very low probability* 5
1. Infected food	☐	☐	☐	☐	☐
2. Vaccinations	☐	☐	☐	☐	☐
3. Alcohol	☐	☐	☐	☐	☐
4. Smoking	☐	☐	☐	☐	☐
5. Not enough exercise	☐	☐	☐	☐	☐
6. Unhealthy habits of eating	☐	☐	☐	☐	☐
7. Getting the cold	☐	☐	☐	☐	☐
8. Falling at the street	☐	☐	☐	☐	☐
9. Sexual assault	☐	☐	☐	☐	☐
10. Sexual harassment	☐	☐	☐	☐	☐
11. Epidemics/infections	☐	☐	☐	☐	☐
12. HIV/AIDS	☐	☐	☐	☐	☐
13. Other sexually transmitted diseases	☐	☐	☐	☐	☐
14. Malaria	☐	☐	☐	☐	☐
15. Diahorrea	☐	☐	☐	☐	☐
16. Drugs	☐	☐	☐	☐	☐

4. My Risk Willingness

In general, how willing are you to take risks in the following situations?

One rmark on each line.	*Most willing* 1	2	*Neither /nor* 3	4	*Would not do it* 5
1. At work	☐	☐	☐	☐	☐
2. In my spare time	☐	☐	☐	☐	☐
3. As a driver of a motor vehicle	☐	☐	☐	☐	☐
4. As a rider of a bicycle	☐	☐	☐	☐	☐
5. As a passenger of a motor vehicle	☐	☐	☐	☐	☐
6. As a pedestrian	☐	☐	☐	☐	☐

Before you continue: Please ensure that you have answered all questions on this page.

5. My Behaviour As A Pedestrian

Approximately how often do you act as described in these statements

One mark on each line.

		Very often [1]	Often [2]	Sometimes [3]	Seldom [4]	Never [5]
1.	Avoid walking on roads with traffic after dark	☐	☐	☐	☐	☐
2.	Take risks in traffic	☐	☐	☐	☐	☐

6. Demographic Information

1. Gender:
   - Female ☐ 1
   - Male ☐ 2

2. Year of birth: 19☐☐

3. Civil status:
   - Married ☐ 1
   - Living with spouse ☐ 2
   - Separated/divorced ☐ 3
   - Single ☐ 4
   - Widow/widower ☐ 5

4. Do you have any children?
   - Yes ☐ 1
   - No ☐ 2

5. If yes, how many children do you have? ⇨ ☐☐ children

6. What kind of religious community do you consider yourself to belong to?
   - Catholic ☐ 1
   - Protestant ☐ 2
   - Other christian ☐ 3
   - Islam ☐ 4
   - Judaism ☐ 5
   - Hinduism ☐ 6
   - Buddhism ☐ 7
   - Atheist/traditional ☐ 8
   - None ☐ 9
   - If other, please specify below: ☐ 10

   Use only UPPERCASE *and one letter in each field.*

   ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

7. Are you literate?
   - Yes ☐ 1
   - Partly read and write ☐ 2
   - No ☐ 3

8. What is your highest level of completed education?
   - Primary/secondary school or equivalent ☐ 1
   - High-school or equivalent ☐ 2
   - Vocational education/training ☐ 3
   - College/University ☐ 4

9. What is your occupational status?
   - Full time employment ☐ 1
   - Part-time employment ☐ 2
   - On sick leave ☐ 3
   - Student ☐ 4
   - Unemployed ☐ 5
   - Retired ☐ 6

10. What kind of area do you live in?
    - Rural area ☐ 1
    - Semi-urban area ☐ 2
    - Urban area ☐ 3

11. Type of major occupation
    - Formal employment ☐ 1
    - Informal employment ☐ 2

Before you continue: Please ensure that you have answered all questions on this page.

12. In what region do you live?

Use only UPPERCASE *and one letter in each field.*

13. What is your average personal monthly income? Please specify in local currency.

Use only UPPERCASE *and one letter in each field.*

14. Do you have a driving license for a car? Yes .. ☐ 1 No .... ☐ 2

15. If yes, which year did you get this license? ..... ⇨

16. Do you have a driving license for another vehicle (e.g. buss, truck, motorcycle)? Yes ... ☐ 1 No .... ☐ 2

17. If yes, which year did you get this license? .. ⇨

Please specify which type of vehicle. *Use only* UPPERCASE *and one letter in each field.*

7. My Opinions About Culture

Below you will find some statements not directly related to traffic safety. However, culture could be related to how people behave in traffic.

1. To what extent do you agree or disagree with the following statements?

One mark on each line.	*Strongly agree* 1	2	*Neither /nor* 3	4	*Strongly disagree* 5
1. The written word always applies	☐	☐	☐	☐	☐
2. Writers/authors are important storytellers in society	☐	☐	☐	☐	☐
3. I remember best what I have read	☐	☐	☐	☐	☐
4. What I read about dangers, I take seriously	☐	☐	☐	☐	☐
5. I consider a written request to be particularly serious	☐	☐	☐	☐	☐
6. I prefer reading what the law says on right and wrong in traffic	☐	☐	☐	☐	☐
7. I enjoy following press debates concerning traffic regulations	☐	☐	☐	☐	☐
8. I prefer a written argument if I'm being accused of making a mistake in traffic	☐	☐	☐	☐	☐
9. What is said always applies	☐	☐	☐	☐	☐
10. I enjoy listening to stories	☐	☐	☐	☐	☐
11. I remember best what I've been told	☐	☐	☐	☐	☐
12. What I hear of dangers I consider to be serious	☐	☐	☐	☐	☐
13. I consider an oral request to be particularly serious	☐	☐	☐	☐	☐
14. I enjoy listening to what others consider right or wrong in traffic	☐	☐	☐	☐	☐
15. I take oral corrections of my behaviour in traffic seriously	☐	☐	☐	☐	☐
16. My inner voice is a good guide to how I should live my life	☐	☐	☐	☐	☐
17. Difficult situations in traffic is best solved by doing what I've been told	☐	☐	☐	☐	☐
18. It is common to follow ones inner voice	☐	☐	☐	☐	☐

Before you continue: Please ensure that you have answered all questions on this page.

One mark on each line.	*Strongly agree* 1	2	*Neither /nor* 3	4	*Strongly disagree* 5
19. If one does not follow ones inner voice, society will fall apart	☐	☐	☐	☐	☐
20. I always listen to my inner voice concerning what precautions I should take	☐	☐	☐	☐	☐
21. I often think of what is right or wrong in traffic	☐	☐	☐	☐	☐
22. If everyone followed their own conviction, traffic would run smoothly	☐	☐	☐	☐	☐
23. It is common to orientate by sound impressions	☐	☐	☐	☐	☐
24. I listen to music a lot	☐	☐	☐	☐	☐
25. I always notice other people's tone of voices	☐	☐	☐	☐	☐
26. I react strongly to sounds signalizing danger	☐	☐	☐	☐	☐
27. While in traffic, I'm especially aware of the sounds around me	☐	☐	☐	☐	☐
28. When someone honks their horn, I think I've done something wrong	☐	☐	☐	☐	☐
29. Few sounds indicate that traffic is running smoothly	☐	☐	☐	☐	☐
30. I find that pictures give us the best stories	☐	☐	☐	☐	☐
31. I often draw pictures/patterns to understand	☐	☐	☐	☐	☐
32. I think a picture can say more than a thousand words	☐	☐	☐	☐	☐
33. It is important to look for signs of danger	☐	☐	☐	☐	☐
34. First when I can see them, I take dangers seriously	☐	☐	☐	☐	☐
35. I act according to the picture of traffic I see	☐	☐	☐	☐	☐
36. Punctilious use of road signs is very important	☐	☐	☐	☐	☐
37. Symbols work better than writing at road signs	☐	☐	☐	☐	☐
38. I often copy the behaviour of the individuals I look up to	☐	☐	☐	☐	☐
39. I think public persons should set good examples	☐	☐	☐	☐	☐
40. I think there should be a connection between life and learning	☐	☐	☐	☐	☐
41. I can see if a person is dangerous	☐	☐	☐	☐	☐
42. Peoples behaviour can change in dangerous situations	☐	☐	☐	☐	☐
43. I'm especially aware of how other people behave in traffic	☐	☐	☐	☐	☐
44. In traffic I usually behave as others expect me to	☐	☐	☐	☐	☐
45. It is more important to notice the behaviour of others in traffic than to look at the road signs	☐	☐	☐	☐	☐

2. To which extent do you agree or disagree with the following statements?

One mark on each line.	*Strongly agree* 1	2	*Neither /nor* 3	4	*Strongly disagree* 5
1. All human beings have a destiny	☐	☐	☐	☐	☐
2. The occurrence of many small injuries and minor accidents are a sign that more serious accidents could occur	☐	☐	☐	☐	☐
3. Religion is a good guide to how I should live my life	☐	☐	☐	☐	☐
4. It is common to trust in destiny while in traffic	☐	☐	☐	☐	☐
5. My religion affects how I behave in traffic	☐	☐	☐	☐	☐
6. If everyone were religious, there would be fewer traffic accidents	☐	☐	☐	☐	☐

If you have a driving licence, please proceed with the rest of the survey. If you do not have a driving licence, do not proceed with the rest of the survey.

Before you continue: Please ensure that you have answered all questions on this page.

8. My Traffic Behaviour

Research shows that most of us violate some traffic regulations at one time or another. Approximately how often do you act as described in these statements?

One mark on each line.

	Very often 1	*Often* 2	*Sometimes* 3	*Seldom* 4	*Never* 5
1. Slow down when there are pedestrians on the road	☐	☐	☐	☐	☐
2. Slow down if I see a pedestrian approaching	☐	☐	☐	☐	☐
3. In consideration of pedestrians, I often avoid driving at night	☐	☐	☐	☐	☐
4. Slow down considerably in densely populated areas	☐	☐	☐	☐	☐
5. Slow down when it is dark	☐	☐	☐	☐	☐
6. Increase speed in densely populated areas	☐	☐	☐	☐	☐
7. Try to pass the car in front of you, even if that car is driving quite fast	☐	☐	☐	☐	☐
8. Ignore traffic regulations to reach your destination in time.	☐	☐	☐	☐	☐
9. Drive above the speed limit to reach a very important appointment	☐	☐	☐	☐	☐
10. Keep such a short distance from the car in front of you, that you wouldn't be able to stop if that car braked suddenly.	☐	☐	☐	☐	☐
11. Get distracted by events in the environment while driving	☐	☐	☐	☐	☐
12. Create dangerous traffic situations as a result of being inattentive	☐	☐	☐	☐	☐
13. Keep on driving, even if you feel tired	☐	☐	☐	☐	☐
14. Drive over shorter distances without wearing a seatbelt	☐	☐	☐	☐	☐
15. Drive longer trips without wearing a seatbelt	☐	☐	☐	☐	☐
16. Slow down because a car behind you is trying to pass	☐	☐	☐	☐	☐
17. Slow down due to a road sign which signals caution	☐	☐	☐	☐	☐
18. Slow down due to difficult driving conditions.	☐	☐	☐	☐	☐
19. Slow down due to slippery driving conditions.	☐	☐	☐	☐	☐
20. Drive after you have had a beer	☐	☐	☐	☐	☐
21. Drive when you have had several beers	☐	☐	☐	☐	☐
22. Drive the morning after heavy alcohol consumption, without knowing if you're completely sober	☐	☐	☐	☐	☐
23. Go as a passenger with a driver you know has been drinking alcohol	☐	☐	☐	☐	☐
24. Reduce my speed considerably where a road sign states that children are playing	☐	☐	☐	☐	☐
25. Slow down in areas where children are playing, even when none are visible	☐	☐	☐	☐	☐
26. Tell a person to slow down, if he/she is driving too fast	☐	☐	☐	☐	☐
27. Discuss traffic safety with others	☐	☐	☐	☐	☐

9. My Accident History

1. Approximately how many km do you drive each month?

0 km	☐ 1	501-1000 km	☐ 5
1-100 km	☐ 2	1001-2000 km	☐ 6
101-200 km	☐ 3	More than 2000 km	☐ 7
201-500 km	☐ 4		

Before you continue: Please ensure that you have answered all questions on this page.

2. Have you been involved in a traffic accident where you were injured (person injury)?

One mark on each line.

	Never (1)	*Once* (2)	*Several times* (3)
1. As a driver	☐	☐	☐
2. As a passenger	☐	☐	☐
3. As a pedestrian	☐	☐	☐
4. When riding a bicycle	☐	☐	☐

3. Have you been involved in a traffic accident where others were injured (person injury)?

One mark on each line.

	No accidents (1)	*One accident* (2)	*2-3 accidents* (3)	*Several accidents* (4)
1. As a driver	☐	☐	☐	☐
2. As a passenger	☐	☐	☐	☐
3. As a pedestrian	☐	☐	☐	☐
4. When riding a bicycle	☐	☐	☐	☐

4. If you have been involved in an accident(s) where someone was injured, how long ago was the last time? ⇨ ☐☐ years and ☐☐ months

5. To what extent do you consider yourself to be responsible for the accident(s)?

One mark only ⇨

- It was my fault only ☐ 1
- I was partly responsible ☐ 2
- It was someone else's fault entirely ☐ 3
- No one in particular could be blamed ☐ 4

6. Have you been involved in a collision with vehicle damages (no person injuries)?

One mark on each line.

	No accidents (1)	*One accident* (2)	*2-3 accidents* (3)	*Several accidents* (4)
1. As a driver	☐	☐	☐	☐
2. As a passenger	☐	☐	☐	☐

7. If you have been involved in an accident with vehicle damage, how long ago was the last time? ⇨ ☐☐ years and ☐☐ months

8. If you have been involved in an accident with vehicle damages, to what extent do you consider yourself to be responsible for the accident(s)? ⇨

- It was my fault only ☐ 1
- I was partly responsible ☐ 2
- It was someone else's fault entirely ☐ 3
- No one in particular could be blamed ☐ 4

Thank you for participating!

Appendix 2: Questionnaire used for Data collection (Swahili Version)

UCHUNGUZI/UTAFITI KUHUSU MTAZAMO KITAMADUNI KATIKA UTAMADUNI WA USALAMA BARABARANI

UTANGULIZI

Shabaha kuu ya mradi huu ni kutafiti tofauti za kimtazamo katika mwenendo na tabia katika suala la usafiri wa magari na usalama barabarani utafiti wa aina hii unaendelea katika nchi mbalimbali hivi sasa. Tunapenda kila mmoja ajibu dodoso hili, hata wale ambao hawana liseni ya udereva kwa kujibu dodoso hili, unatoa habari muhimu sana kuhusu usalama barabarani.

WACHUNGUZI

Uchunguzi unafanywa na Chuo Kikuu cha Norway cha Sayansi na Teknolojia kwa kushirikiana na Chuo Kikuu cha Dar es Salaam, Tanzania.

USIRI WA MAJIBU

Habari zote zitakazotolewa ni siri. Wakati wa kuchambua data haitawezekana kujua washiriki waliotoa habari. Ushiriki ni hiari.

MAJIBU YA UTAFITI/UCHUNGUZI

Hakuna majibu sahihi wala majibu yasiyo sahihi tutavutiwa zaidi na maoni yako ya kweli kuhusu usalama barabarani. Ni muhimu kujibu dodoso zote, bali kama yapo maswali usioweza kujibu, endelea na maswali mengine. Tuma majibu ya utafiti katika bahasha uliyopewa.

Inachukua karibu dakika 30 kumaliza maswali haya ya utafiti. Tafadhali hakikisha kuwa kurasa zote 1-8 zina maswali.

Ahsante kwa kukubali kushiriki.

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Profesa
Idara ya Saikolojia, NTNU

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Associate profesa
Idara ya Jiografia, NTNU

Deus Damian Komba
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Idara ya Jiografia, NTNU

NTNU
Innovation and Creativity

TAFADHALI SOMA SEHEMU HII KABLA YA KUANZA.	Fomu hii itasomwa na masharti. Tafadhali zingatia maelekezo: • *Tumia peni nyeusi au bluu* • *Andika vizuri, usiandike nje ya viboksi.* • *Weka alama ☒ kwa kiboksi kilicho sahihi na ■ kwa kiboksi kisicho sahihi.* • *Tafadhali usirudufu fomu hii. Orijinali ni kwa ajili ya kusomwa kwa usahihi na mashini* • *Weka alama kwenye kiboksi kimoja tu kwa kila swali isipokuwa kama imeelekezwa vinginevyo.*

1. Maoni yangu juu ya Usalama barabarani

Ni kwa kiwango/kiasi gani unakubaliana au kutokukubaliana na kauli hizi juu ya nyendo za watu barabarani au uendeshaji wa magari kwa jumla?
Alama moja kila mstari.

	Nakubali kabisa 1	2	3	4	*Sikubali kabisa* 5
1. Ili kudumisha usalama barabarani ni muhimu kutojali baadhi ya kanuni za usalama barabarani	☐	☐	☐	☐	☐
2. Ni mantiki kuongeza kasi ya gari ili kuyapita magari yaendayo polepole mno	☐	☐	☐	☐	☐
3. Inatakiwa kuheshimu sheria za usalama barabarani, bila kutegemea hali ya uendeshaji wa magari ilivyo	☐	☐	☐	☐	☐
4. Ni mantiki kutojali taa nyekundu wakati hakuna magari mengine au watu wanaovuka barabara	☐	☐	☐	☐	☐
5. Madereva wanaovunja sheria za usalama barabarani sio tishio kubwa sana kiusalama ikilinganishwa na wanaofuata sheria	☐	☐	☐	☐	☐
6. Sheria za usalama barabarani zinatatiza mno na hivyo ni vigumu kuzizingatia wakati wa kuendesha gari	☐	☐	☐	☐	☐
7. Kama mwenda kwa miguu anagongwa na gari, ndiye wa kulaumiwa	☐	☐	☐	☐	☐
8. Ikiwa wewe ni dereva makini, inakubalika kuendesha kasi kidogo	☐	☐	☐	☐	☐
9. Kuwepo na adhabu kali endapo uendeshaji ni wa kasi sana	☐	☐	☐	☐	☐
10. Ikitokea hakuna njia mbadala, nitamruhusu dereva hatarishi aniendeshe kurudi nyumbani	☐	☐	☐	☐	☐
11. Kama marafiki zangu wangekuwa abiria wa dereva hatarishi, ningewaunga mkono	☐	☐	☐	☐	☐
12. Ninajisikia ni wajibu wangu kumsema dereva kama anaendesha kasi sana	☐	☐	☐	☐	☐
13. Sikubali kabisa kuendesha gari baada ya kunywa pombe	☐	☐	☐	☐	☐
14. Sitaruhusu kabisa dereva mlevi anipeleke nyumbani huku nikijua ameshakunywa pombe	☐	☐	☐	☐	☐
15. Adhabu kali itolewe kwa kumgonga kwa gari mwenda kwa miguu	☐	☐	☐	☐	☐
16. Uendeshaji magari baada ya giza kuingia, uepukwe kwa misingi ya usalama barabarani	☐	☐	☐	☐	☐
17. Ninaelewa vya kutosha wa sheria za usalama barabarani	☐	☐	☐	☐	☐
18. Waenda kwa miguu wanao wajibu mkubwa wa kuhakikisha hawagongwi na magari	☐	☐	☐	☐	☐
19. Kwa kawaida madereva wanaishiwa nguvu mbele ya waenda kwa miguu wasiotabirika	☐	☐	☐	☐	☐

2. Uamuzi wangu hatarishi nikiwa barabarani

1. Kuna uwezekano kiasi gani kwamba utaumia/utajeruhiwa katika matukio yafuatayo?
Alama moja katika kila kisehemu.

	Uwezekano mkubwa 1	2	3	4	*Hakuna uwezekano* 5
1. Gari langu linapokwenda nje ya barabara	☐	☐	☐	☐	☐
2. Kugongana na gari uso kwa uso	☐	☐	☐	☐	☐
3. Kugongana na gari lingine kwa nyuma	☐	☐	☐	☐	☐

	Uwezekano mkubwa				Hakuna uwezekano
	1	2	3	4	5
4. Kugongana kutokana na kubadili laini ya barabara	☐	☐	☐	☐	☐
5. Kugongana na mwenda kwa miguu	☐	☐	☐	☐	☐
6. Gari linapinduka likiwa barabarani	☐	☐	☐	☐	☐
7. Kugongana na mnyama	☐	☐	☐	☐	☐
8. Ajali wakati wa kuegesha gari	☐	☐	☐	☐	☐
9. Kama dereva wa motakaa	☐	☐	☐	☐	☐
10. Kama dereva wa baiskeli	☐	☐	☐	☐	☐
11. Kama mwenda kwa miguu	☐	☐	☐	☐	☐
12. Kama abiria katika motakaa	☐	☐	☐	☐	☐

2. Ikiwa ajali hizi zikitokea kwangu, ni kwa kiasi gani zitaniathiri?
Alama moja kila sehemu.

	Mbaya sana		Vyovyote		Kidogo sana
	1	2	3	4	5
1. Gari langu kuharibika kabisa	☐	☐	☐	☐	☐
2. Kugongana na gari uso kwa uso	☐	☐	☐	☐	☐
3. Kugongana na gari lingine kwa nyuma	☐	☐	☐	☐	☐
4. Kugongana kutokana na kubadili laini ya barabara	☐	☐	☐	☐	☐
5. Kugongana na mwenda kwa miguu	☐	☐	☐	☐	☐
6. Gari inapinduka barabarani	☐	☐	☐	☐	☐
7. Kugongana na mnyama	☐	☐	☐	☐	☐
8. Ajali wakati wa kuegesha gari	☐	☐	☐	☐	☐

3. Uamuzi wangu nikikabiliwa na hatari nyingine

1. Ni kwa kiasi gani utaathirika kama wewe binafsi unakumbana na majanga yafuatayo?
Alama moja kwa kila kipengele.

	Uwezekano mkubwa		Uwezekano kotekote		Uwezekano mdogo sana
	1	2	3	4	5
1. Bunduki mkononi	☐	☐	☐	☐	☐
2. Visu	☐	☐	☐	☐	☐
3. Vyombo vya anga	☐	☐	☐	☐	☐
4. Polisi wanyang'anyi	☐	☐	☐	☐	☐
5. Magari/vyombo vya moto	☐	☐	☐	☐	☐
6. Uwindaji	☐	☐	☐	☐	☐
7. Uogeleaji	☐	☐	☐	☐	☐
8. Dawa za uzazi wa mpango	☐	☐	☐	☐	☐
9. Riadha	☐	☐	☐	☐	☐
10. Vita	☐	☐	☐	☐	☐
11. Ukatili	☐	☐	☐	☐	☐
12. Silaha za maangamizi makubwa	☐	☐	☐	☐	☐
13. Ngurumo	☐	☐	☐	☐	☐
14. Maporomoko	☐	☐	☐	☐	☐
15. Mafuriko	☐	☐	☐	☐	☐
16. Moto	☐	☐	☐	☐	☐
17. Umaskini	☐	☐	☐	☐	☐

Kabla ya kuendelea, tafadhali hakikisha kama hujasahau kujibu dodoso za ukurasa huu.

2. Ni kwa kiasi gani utaathirika wewe binafsi kama utakumbana na madhara ya kiafya kutokana na majanga yafuatayo?

Alama moja kwa kila kipengele.

	Uwezekano mkubwa 1	2	*Uwezekano kotekote* 3	4	*Uwezekano mdogo sana* 5
1. Chakula kilichoharibika	☐	☐	☐	☐	☐
2. Chanjo	☐	☐	☐	☐	☐
3. Pombe	☐	☐	☐	☐	☐
4. Uvutaji Sigara	☐	☐	☐	☐	☐
5. Mazoezi yasiyotosheleza	☐	☐	☐	☐	☐
6. Ulaji mbaya	☐	☐	☐	☐	☐
7. Kupata mafua/fluu	☐	☐	☐	☐	☐
8. Kuanguka barabarani	☐	☐	☐	☐	☐
9. Mashambulizi ya aibu kijinsia	☐	☐	☐	☐	☐
10. Ukatili kijinsi	☐	☐	☐	☐	☐
11. Magonjwa ambukizi	☐	☐	☐	☐	☐
12. Ukimwi	☐	☐	☐	☐	☐
13. Magonjwa mengine ya zinaa	☐	☐	☐	☐	☐
14. Malaria	☐	☐	☐	☐	☐
15. Kuharisha	☐	☐	☐	☐	☐
16. Madawa ya kulevya	☐	☐	☐	☐	☐

4. Utajari wa kuchukua uamuzi hatarishi

Kwa jumla uko tayari kiasi gani kuchukua uamuzi hatarishi katika mazingira yafuatayo?

Alama moja kwa kila kipengele.

	Ni tayari sana 1	2	*Vyovyote* 3	4	*Nisingefanya hivyo* 5
1. Mahali pa kazi	☐	☐	☐	☐	☐
2. Katika muda wa utawala binafsi	☐	☐	☐	☐	☐
3. Kama dereva wa motakaa	☐	☐	☐	☐	☐
4. Kama mwendesha baiskeli	☐	☐	☐	☐	☐
5. Kama abiria wa motokaa	☐	☐	☐	☐	☐
6. Kama mwenda kwa miguu	☐	☐	☐	☐	☐

5. Tabia yangu kama mwenda kwa miguu

Ni kwa kiasi gani unaelezeka katika kauli zifuatazo?

Alama moja kila kipengele.

	Mara nyingi 1	*Mara kwa mara* 2	*Mara kadhaa* 3	*Mara chache* 4	*Hata kidogo* 5
1. Kuepuka kutembea Barabarani gizani pakiwa na magari	☐	☐	☐	☐	☐
2. Kuchukua uamuzi hatarishi kwa usalama barabarani	☐	☐	☐	☐	☐

6. Habari za idadi ya watu

1. Jinsi:
   - Ke ☐ 1
   - Me ☐ 2
2. Mwaka wa kuzaliwa: 19☐☐
3. Kuoa/kuolewa:
   - Umeoa/umeolewa ☐ 1
   - Unaishi na mwenzio ☐ 2
   - Umetengana/umeachika ☐ 3
   - Hujaoa/hujaolewa ☐ 4
   - Mjane ☐ 5

3 | SW

Kabla ya kuendelea, tafadhali hakikisha kama hujasahau kujibu dodoso za ukurasa huu.

4. Unao watoto? Ndiyo ☐1 Hapana ☐2 ⇨ 5. Kama ndiyo, wangapi? ⇨ ☐☐

6. Dini yako ni ipi? ⇨

Katoliki	☐1	Hindu	☐6
Protestanti	☐2	Budha	☐7
Dini nyingine ya Kikristo	☐3	Asili	☐8
Islamu	☐4	Hakuna	☐9
Kiyahudi	☐5	Nyingine yoyote	☐10

Tumia herufi KUBWA *tu, herufi moja katika kila chumba*

7. Unajua kusoma na kuandika? ⇨ Ndiyo ☐1 Kidogo kusoma na kuandika ☐2 Hapana ☐3

8. Ulimaliza kiwango gani cha elimu? ⇨

Msingi/Sekondari/au inayolingana na hiyo	☐1
Kidato cha sita	☐2
Mafunzo/elimu ufundii	☐3
Chuo/chuo kikuu	☐4

9. Aina yako ya ajira ni ipi? ⇨

Kudumu	☐1	Mwanafunzi	☐4
Muda/mkataba	☐2	Sijaajiriwa	☐5
Likizo ya ugonjwa	☐3	Mstaafu	☐6

10. Unaishi wapi? ⇨

Vijijini	☐1
Mji mdogo	☐2
Mjini	☐3

11. Aina kuu ya shughuli/kazi: ⇨

Ajira rasimi	☐1
Ajira isiyo rasimi	☐2

12. Unaishi mkoa upi?
Tumia herufi KUBWA *na kila chumba herufi moja.*

13. Wastani wa pato lako kwa mwezi ni kiasi gani? *Jibu kwa fedha za nchi yako.*
Tumia herufi KUBWA *na kila chumba herufi moja.*

14. Una leseni ya udereva wa gari dogo? ⇨ Ndiyo ☐1 Hapana ☐2 ⇨ 15. Ikiwa ndiyo, ni mwaka gani uliipata? ⇨ ☐☐☐☐

16. Una leseni ya udereva wa aina nyingine (kama gari la abiria, lori, pikipiki)? ⇨ Ndiyo ☐1 Hapana ☐2 ⇨ 17. Ikiwa ndiyo, ni mwaka gani uliipata? ⇨ ☐☐☐☐

Tafadhali andika aina ya gari. *Tumia herufi KUBWA na kila chumba herufi moja.*

Kabla ya kuendelea, tafadhali hakikisha kama hujasahau kujibu dodoso za ukurasa huu.

7. Maoni yangu kuhusu utamaduni

Hapa nchini utaona kauli kadhaa ambazo hazihusiani moja kwa moja na usalama barabarani. Hata hivyo, kiutamaduni zingeweza kuhusishwa na namna watu wanavyoenenda katika mambo ya usalama barabarani.

1. Kwa kiwango gani unakubaliana au kutokukubaliana na kauli zifuatazo?

Alama moja kila kauli.	*Nakubali kabisa* 1	2	*Nakubali kotekote* 3	4	*Sikubaliani kabisa* 5
1. Wakati wote maandishi yanaheshimika	☐	☐	☐	☐	☐
2. Waandishi ni wasimulizi muhimu katika jamii	☐	☐	☐	☐	☐
3. Ninakuwa na kumbukumbu zaidi ya jambo nililolisoma	☐	☐	☐	☐	☐
4. Lolote ninalosoma kuhusu hatari, ninatilia maanani	☐	☐	☐	☐	☐
5. Ninatilia maanani matakwa ya kimaandishi	☐	☐	☐	☐	☐
6. Ninapendelea kusoma sheria inavyosema kuhusu usahihi na makosa ya usalama barabarani	☐	☐	☐	☐	☐
7. Ninafurahia mijadala ya kanuni za usalama barabarani katika vyombo vya habari	☐	☐	☐	☐	☐
8. Ninapendelea hoja ya maandishi kama ninashtakiwa kwa makosa ya usalama barabarani	☐	☐	☐	☐	☐
9. Mara nyingi kinachosemwa kinatokea	☐	☐	☐	☐	☐
10. Ninafurahia kusikiliza hadithi/matukio	☐	☐	☐	☐	☐
11. Ninakumbuka zaidi kile nilichoambiwa	☐	☐	☐	☐	☐
12. Ninatilia maanani kitu hatarishi ninachosikia	☐	☐	☐	☐	☐
13. Ninatilia maanani matakwa ya mdomo	☐	☐	☐	☐	☐
14. Ninafurahia kusikiliza watu wengine wanavyozichukulia kanuni au makosa ya usalama barabarani	☐	☐	☐	☐	☐
15. Ninaheshimu kukosolewa kwa mdomo kuhusu mwenendo wangu katika usalama barabarani	☐	☐	☐	☐	☐
16. Yaliyo moyoni mwangu yananiongoza namna ninavyopaswa kuishi	☐	☐	☐	☐	☐
17. Mazingira magumu katika usalama barabarani yanatatuliwa vizuri zaidi kwa kufanya nilivyoambiwa	☐	☐	☐	☐	☐
18. Ni kawaida kwa mtu kufuata yaliyo moyoni mwake	☐	☐	☐	☐	☐
19. Kama mtu hafuati yaliyo moyoni mwake, jamii itameguka	☐	☐	☐	☐	☐
20. Wakati wote nazingatia yaliyo moyoni mwangu kuhusu tahadhari ninazopaswa kuchukua	☐	☐	☐	☐	☐
21. Mara nyingi nafikiria lililo sahihi au kosa katika usalama barabarani	☐	☐	☐	☐	☐
22. Kama kila mtu angefanya anavyoona, usalama barabarani ungefanikiwa	☐	☐	☐	☐	☐
23. Ni kawaida kutambua sauti mbalimbali	☐	☐	☐	☐	☐
24. Ninasikiliza sana muziki	☐	☐	☐	☐	☐
25. Kila wakati najali mitazamo ya wengine	☐	☐	☐	☐	☐
26. Ninaathirika vibaya kwa kelele zinazoashiria hatari	☐	☐	☐	☐	☐
27. Nikiwa barabarani, kwa vyovyote nitasikiliza kelele zinazonizunguka	☐	☐	☐	☐	☐
28. Mtu anapopiga honi, najisikia kuwa nimefanya kosa Fulani	☐	☐	☐	☐	☐
29. Kelele chache ni ishara kuwa magari yanayoenda salama	☐	☐	☐	☐	☐
30. Ninaona kuwa mabango yanatoa habari nyingi	☐	☐	☐	☐	☐
31. Mara nyingi ninachora picha/michoro ili nielewe	☐	☐	☐	☐	☐
32. Nadhani picha zina ujumbe mwingi kuliko maneno mengi (elfu moja)	☐	☐	☐	☐	☐

	Nakubali kabisa 1	2	Nakubali kotekote 3	4	Sikubaliani kabisa 5
33. Ni muhimu kuangalia ishara za hatari	☐	☐	☐	☐	☐
34 Pindi nizionapo ishara za hatari nazitilia maanani	☐	☐	☐	☐	☐
35. Ninatenda kufuatana na ishara za barabarani ninazoziona	☐	☐	☐	☐	☐
36. Kuwa makini katika kuzingatia alama za barabarani ni muhimu sana	☐	☐	☐	☐	☐
37. Alama za barabarani zinafanya kazi nzuri kuliko maneno	☐	☐	☐	☐	☐
38. Mara nyingi nawaiga ninaopenda kuwafuata	☐	☐	☐	☐	☐
39. Nadhani viongozi wanapaswa kuwa mfano	☐	☐	☐	☐	☐
40. Nadhani ni vema kuwepo na uhusiano kati ya maisha na kujifunza	☐	☐	☐	☐	☐
41. Naweza kumtambua mtu hatari	☐	☐	☐	☐	☐
42. Tabia za watu zinaweza kubadilika wakati wa hatari	☐	☐	☐	☐	☐
43. Kwa jumla ninatambua jinsi watu wengine wanyoenenda katika masuala ya usalama barabarani	☐	☐	☐	☐	☐
44. Nikiwa barabarani ninaenenda kama wengine wanavyotegemea nifanye	☐	☐	☐	☐	☐
45. Ni muhimu kujua tabia za wengine kuhusu Usalama barabarani kuliko kuangalia ishara za barabarani	☐	☐	☐	☐	☐

2. Ni kiwango gani unakubaliana au kutokukubaliana na kauli zifuatazo?

Alama moja kila mstari.	Nakubali kabisa 1	2	Nakubali kokote 3	4	Sikubaliani kabisa 5
1. Binadamu wote wana mwisho wa safari	☐	☐	☐	☐	☐
2. Matukio mengi ya kujeruhiwa kidogo na ajali ndogo ni ishara ya ajali kubwa kutokea	☐	☐	☐	☐	☐
3. Dini zinatoa mwongozo mzuri kuhusu namna ninavyopaswa kuishi	☐	☐	☐	☐	☐
4. Ni kawaida kuwa na imani ya kumaliza safari yangu niwapo barabarani	☐	☐	☐	☐	☐
5. Dini yangu inaniathiri jinsi ninavyoenenda katika usalama barabarani	☐	☐	☐	☐	☐
6. Kama kila mtu angezingatia imani yake katika dini, kungekuwa na ajali chache za barabarani	☐	☐	☐	☐	☐

Kama unayo leseni ya udereva endelea kujibu maswali yanayofuata.
Iwapo huna leseni ya udereva usiendelee na sehemu inayofuata.

8. Mwenendo wangu barabarani

Utafiti unaonesha kuwa wengi wetu wanakiuka baadhi ya kanuni za usalama barabarani hapa na pale. Ni kwa kiasi gani unatenda kama ilivyoelezwa katika kauli zifuatazo?

Alama moja kila kipengele.	Mara nyingi 1	Mara kwa kasi 2	Mara kadhaa 3	Mara chache 4	Sivyo kabisa 5
1. Punguza mwendo kukiwa na waenda kwa miguu barabarani	☐	☐	☐	☐	☐
2. Ninapunguza mwendo nikimkaribia mwenda kwa miguu	☐	☐	☐	☐	☐
3. Kwa kuwajali waenda kwa miguu, mara nyingi siendeshi gari usiku	☐	☐	☐	☐	☐
4. Ninapunguza mwendo sana pakiwa na watu wengi barabarani	☐	☐	☐	☐	☐
5. Punguza mwendo kukiwa na giza	☐	☐	☐	☐	☐
6. Ongeza mwendo penye watu wengi	☐	☐	☐	☐	☐
1. Jaribu kupita gari iliyo mbele yako hata kama inaendeshwa kasi	☐	☐	☐	☐	☐
2. Puuzia kanuni za usalama barabarani ili uwahi kufika uendako	☐	☐	☐	☐	☐

	Mara nyingi 1	Mara kwa kasi 2	Mara kadhaa 3	Mara chache 4	Sivyo kabisa 5
9. Endesha zaidi ya kasi iliyowekwa ili uwahi muda wa mihadi	☐	☐	☐	☐	☐
10. Kuwa karibu sana na gari iliyoko mbele kiasi cha kushindwa kusimama kama gari linasimama ghafla	☐	☐	☐	☐	☐
11. Kuingiliwa na matukio ya barabarani wakati unaendesha gari	☐	☐	☐	☐	☐
12. Kusababisha mazingira ya hatari barabarani kwa sababu ya kutokuwa makini	☐	☐	☐	☐	☐
13. Kuendelea kuendesha hata kama umechoka	☐	☐	☐	☐	☐
14. Kuendesha masafa mafupi bila kufunga mkanda	☐	☐	☐	☐	☐
15. Kuendesha masafa marefu bila kufunga mkanda	☐	☐	☐	☐	☐
16. Kupunguza mwendo kwa sababu gari iliyo nyuma inataka kukupita	☐	☐	☐	☐	☐
17. Kupunguza mwendo kutokana na ishara za tahadhari barabarani	☐	☐	☐	☐	☐
18. Kupunguza mwendo kwa sababu ya mazingira magumu ya kuendesha	☐	☐	☐	☐	☐
19. Kupunguza mwendo kutokana na utelezi	☐	☐	☐	☐	☐
20. Kuendesha gari baada ya kunywa pombe moja	☐	☐	☐	☐	☐
21. Kuendesha gari baada ya kunywa pombe kadhaa	☐	☐	☐	☐	☐
22. Kuendesha gari baada ya kunywa pombe sana bila kujua kuwa si salama	☐	☐	☐	☐	☐
23. Kuendesha gari asubuhi baada ya kunywa pombe sana bila kutojua kuwa ni salama	☐	☐	☐	☐	☐
24. Kukubali kuwa abiria huku ukijua kuwa dereva alishakunywa pombe	☐	☐	☐	☐	☐
25. Punguza mwendo sana mahali wanapocheza watoto hata kama hawapo	☐	☐	☐	☐	☐
26. Kumwambia mtu kupunguza mwendo kama anaendesha kasi sana	☐	☐	☐	☐	☐
27. Jadili usalama barabarani na wengine	☐	☐	☐	☐	☐

9. Historia yangu kuhusu ajali

1. Kwa wastani unaendesha kilometa ngapi kwa mwezi? ⇨

0 km ☐ 1
1 – 100 km ☐ 2
101 – 200 km ☐ 3
201 – 500 km ☐ 4
5001 – 1000 km ☐ 5
1001 – 2000 km ☐ 6
Zaidi ya 2000 km ☐ 7

2. Katika kipindi cha miaka 5 iliyopita, umewahi kupata ajali barabarani na kujeruhiwa? ⇨

Alama moja kila sehemu.

	Hapana kabisa 1	Mara moja 2	Mara nyingi 3
1. Kama dereva	☐	☐	☐
2. Kama abiria	☐	☐	☐
3. Kama mwenda kwa miguu	☐	☐	☐
4. Nikiendesha baiskeli	☐	☐	☐

3. Katika kipindi cha miaka 5 iliyopita, umewahi kupata ajali barabarani na wengine kujeruhiwa? ⇨

Alama moja kila sehemu.

	Hapana 1	Mara moja 2	Mara 2 - 3 3	Mara nyingi 4
1. Kama dereva	☐	☐	☐	☐
2. Kama abiria	☐	☐	☐	☐
3. Kama mwenda kwa miguu	☐	☐	☐	☐
4. Nikienda baiskeli	☐	☐	☐	☐

4. Katika kipindi cha miaka 5 iliyopita au zaidi, umewahi kupata ajali barabarani na kujeruhiwa? ⇨

Alama moja kila sehemu.

	Hapana kabisa 1	*Mara moja* 2	*Mara nyingi* 3
1. Kama dereva	☐	☐	☐
2. Kama abiria	☐	☐	☐
3. Kama mwenda kwa miguu	☐	☐	☐
4. Nikiendesha baiskeli	☐	☐	☐

5. katika kipindi cha miaka mitano au zaidi iliyopita, uliwahi kupata ajali ambapo watu wengine walijeruhiwa? ⇨

Alama moja kila sehemu.

	Hapana 1	*Mara moja* 2	*Mara 2 - 3* 3	*Mara nyingi* 4
1. Kama dereva	☐	☐	☐	☐
2. Kama abiria	☐	☐	☐	☐
3. Kama mwenda kwa miguu	☐	☐	☐	☐
4. Nikienda baiskeli	☐	☐	☐	☐

6. Kama uliwahi kupata ajali ambapo mtu mwingine alijeruhiwa, ilikuwa muda gani uliyopita? ⇨ Miaka mingapi ⇨ ☐☐ Miezi mingapi ⇨ ☐☐

7. Ni kiasi gani unaona wewe kuwa ni msababishi wa ajali? ⇨

Alama moja kila sehemu.

Ni kosa langu ☐ 1
Kiasi ni kosa langu ☐ 2
Ilikuwa kosa la mwingine ☐ 3
Hakuna wa kulaumu ☐ 4

8. Katika kipindi cha miaka 5 iliyopita, umewahi kupata ajali ya kugonga gari ambapo gari iliharibika lakini hakuna alieumia/ majeruhi? ⇨

Alama moja kila sehemu.

	Hapana 1	*Mara moja* 2	*Mara 2 - 3* 3	*Mara nyingi* 4
1. Kama dereva	☐	☐	☐	☐
2. Kama abiria	☐	☐	☐	☐

9. Katika kipindi cha miaka 5 au zaidi iliyopita, uliwahi kupata ajali ya kugonga gari ambapo gari iliharibika lakini hakuna alieumia/majeruhi? ⇨

Alama moja kila sehemu.

	Hapana 1	*Mara moja* 2	*Mara 2 - 3* 3	*Mara nyingi* 4
1. Kama dereva	☐	☐	☐	☐
2. Kama abiria	☐	☐	☐	☐

10. Kama uliwahi kupata ajali ambapo gari iliharibika ilikuwa ni muda gani uliyopita? ⇨ Miaka mingapi ⇨ ☐☐ Miezi mingapi ⇨ ☐☐

11. Kama uliwahi kupata ajali ambapo gari iliharibika, ni kiasi gani unafikiri wewe ni chanzo? ⇨

Alama moja kila sehemu.

Ni kosa langu ☐ 1
Kiasi ni kosa langu ☐ 2
Nikosa la mwingine ☐ 3
Hakuna wa kulaumiwa ☐ 4

Appendix 3: Interview guide for the primary informant

- Age?
- Sex?
- Occupation?
- Which institution or organization are you working?
- Level of education?
- Working experience?
- Are you married? How many children do you have?
- Are you a driver? For how long have you been driving?
- How did you train for your driver's license?
- Do you consider owning a private car is important in this area? Why do you think so?
- Do you sometimes walk in the street or cross it on foot? Tell me about it.
- Are there any challenges you face while crossing or walking along the roadway? How would you describe them?
- Do you think pedestrian road user attitudes and behavior pose a danger to traffic safety in this area? In what ways?
- Do the road network and conditions in this area influence how you or others cross/walk in the roadway?
- During the time you walk in the street, do you have any concerns about drivers who use the road? Describe them!
- Do you think the way you or others cross or walk in the roadway affect driving?
- Could you describe what people who walk in the street do that you think can bring about traffic accidents?
- Could you tell me why you think pedestrians in this area behave that way?
- Whom do you think should be held responsible if a car kills a pedestrian: driver or pedestrian? Why?
- What is your impression about traffic law enforcement regarding pedestrians in this area?
- Do you know if a pedestrian has been punished before for traffic offences?
- What do you perceive to be the risk factors on the roads while walking?
- What do you perceive to be the risk factors on the roads while driving?
- Do you feel unsafe that as a pedestrian you could be involved and injured in traffic crash?
- Do you worry that other pedestrians could be involved and injured in a traffic crash but not you?
- Are you affiliated with any religion?
- Do you think religious values and norms affect people the way they behave on traffic? How?
- In what ways does the nature of your religion affect the way you drive?
- On the other hand, in what way does the nature of your religion affect the way you behave in traffic?

- What attitudes of drivers do you dislike?
- How do you perceive pedestrian attitudes to road use?
- What do you think motivates drivers to speed, overload or double-park?
- What do you think motivates people to buy worn out or used cars?
- What do you think motivates drivers to violate traffic rules in this area?
- What behaviours of drivers lead to accidents?
- What are some of the unsafe behaviours that you engage in as a driver while on the road?
- What kind of road safety measures will best protect vulnerable road users such as pedestrians, children, disabled etc. in this area?
- Do you have anything you would like to tell?

Appendix 4: Interview guide for the key informants
Introduction

The aims and objective of the study, anonymity and knowing each other.

Personal information

- Age?
- Sex?
- Occupation?
- Level of education?
- Working experience?
- Traffic experience as a driver?
- Which institution or organization is he/she representing?
- Are you married? How many children do you have?

Attitudes and behaviour

- Can you describe any attitude traits of road users in relation to their daily behavior on traffic?
- Are there any challenges you face while crossing or walking along the roadway? How would you describe them?
- Do you think pedestrian road use attitudes and behaviour pose a danger to traffic safety in this area? In what ways?
- Does the road network and condition in this area influence how you or others cross/walk in the roadway?
- During the time you walk in the street, do you have any concerns about drivers who ply the road? Describe them!
- Do you think the way you or others cross or walk in the roadway affect driving?
- Could you describe what people who walk in the street do that you think can bring about traffic accidents?
- Could you tell me why you think pedestrians in this area behave that way?
- Who do you think should be held responsible if a car kills a pedestrian: driver or pedestrian?
- What is your impression about traffic law enforcement regarding pedestrians in this area?

Religion and behavior

- Is there any association between religious values and traffic accidents
- Do you think religious values and norms affect people the way they behave on traffic? How?
- In what ways does the nature of your religion affect the way you drive?
- Alternatively, in what ways does the nature of your religion affect the way you behave on traffic?
- Are there any limitations for religious organizations to engage into activities which are not religious?
- How do you interpret traffic accidents based on your religion? Who is to be blamed?
- In your organization, how do you participate in combating the problem of traffic accidents?
- Do you associate with government and other stake holders in combating the problem of traffic accidents?
- Do you think other religions are playing their role to the problem of traffic accidents? How?
- Do you believe the government and other stakeholders do the right approach in combating the problem of traffic accidents? Do you agree with them? In which ways?

Government officials.

- What is done by the government in combating the problem of traffic accidents in the country?
- What is expected to be done by the government to combat the problem of traffic accidents?
- Who is responsible to the problem of traffic accidents? How?
- Is the government associating with other stakeholders in combatting the problem of traffic accidents?
- Are there policies for traffic safety? Can you describe them?
- Are their specific traffic laws and regulation to enforce traffic safety in Tanzania? Can you describe them?

Traffic police

- What is NRSC?
- Who are the members
- Why was your chosen position to be the Permanent Secretary of NRSC?

- Which grounds did NRSC formulated?
- Are you satisfied with the organization? Why?
- What are the limitations of NRSC?
- What are strengths of NRSC?
- Do you have anything more you would like to tell me?

Traditionalists

- Is there any association between Traditional values and traffic accidents
- Do you think Traditional values and norms affect the way people behave on traffic? How?
- In what ways does the nature of your Tradition affect the way you drive?
- Alternatively, in what way does the nature of your Tradition affect the way you behave in traffic?
- Are there any limitations for traditional activities to be engaged into road safety measures?
- How do you interpret traffic accidents based on your tradition? Who is to be blamed?
- Do you associate with government and other stakeholders in combating the problem of traffic accidents? How?
- Do you think other traditions are playing their role to the problem of traffic accidents? How?
- Do you believe the government and other stakeholders do the right approach in combating the problem of traffic accidents? Do you agree with them? In which ways?

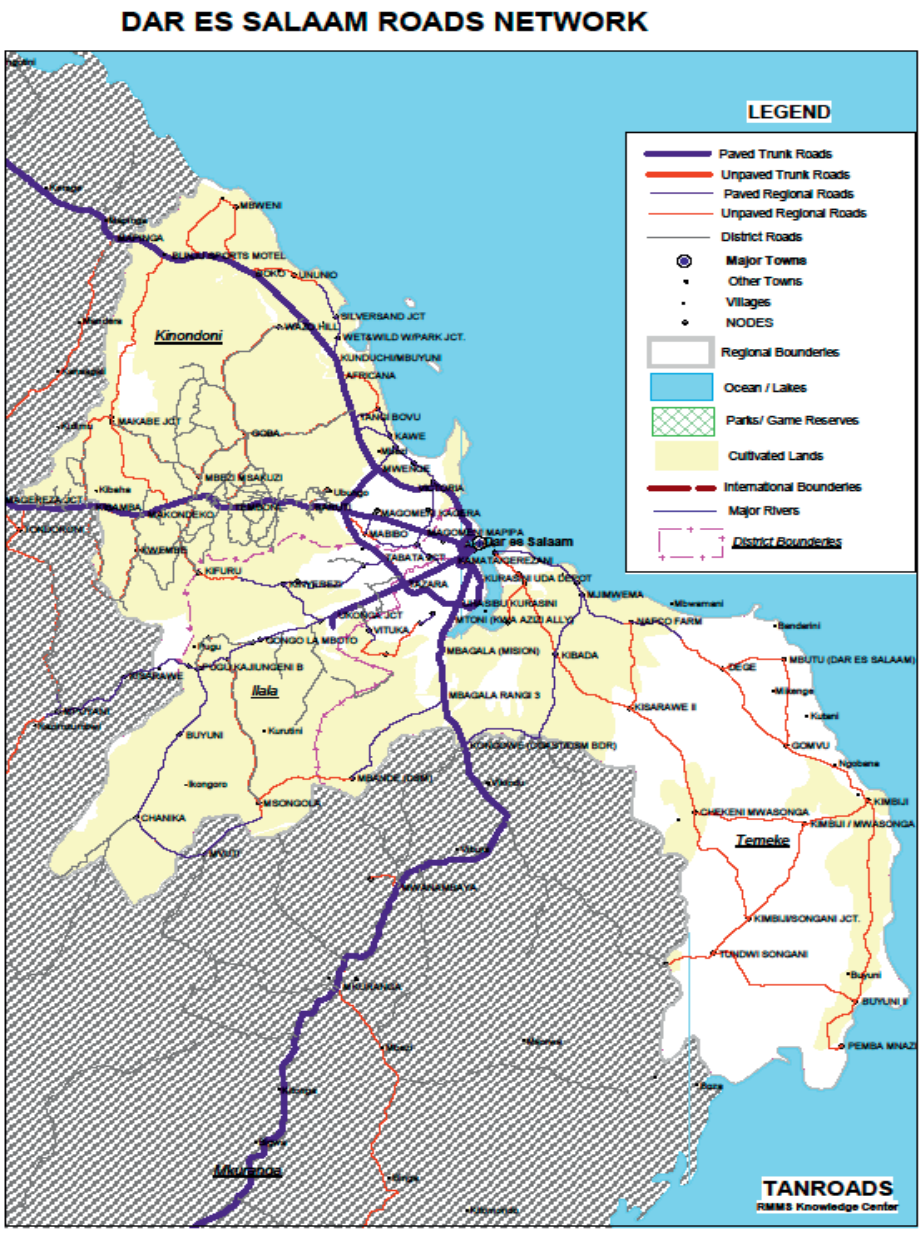
Organizations

- Do you have any activities linked to road safety? Can you describe them?
- Why have you chosen such activities? What is your motive?
- Do you think the government is doing good enough to tackle the problem of traffic accidents? How?
- Who is to be blamed for the problem of traffic accidents?
- Can you describe the problem of traffic accidents in Tanzania?
- What do you think is the best way to approach the problem of traffic accidents?
- Do you collaborate with other stakeholders in combating the problem of traffic accidents? How?
- Do you get good cooperation from the government specifically on road safety issues? In which ways?
- Do you use any government guide in approaching road safety activities in your organization? Can you describe what kind of guides they are?

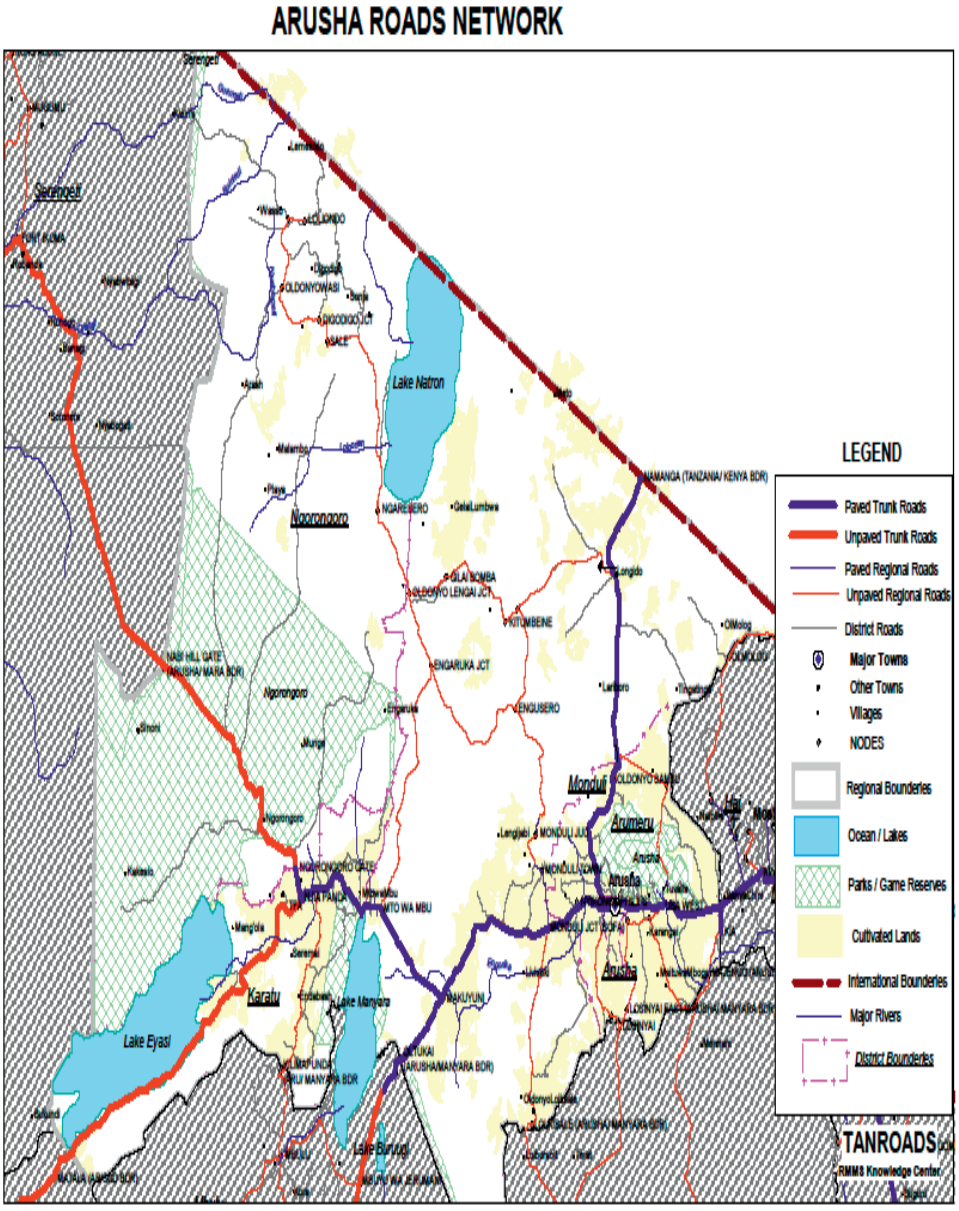
Appendix 5: Interview guide for the focus group discussion

- When you think about traffic accidents in your district. who do you think is responsible for controlling road traffic accidents in your district, how?
- Do you have any activities linked to road safety in the district? Can you describe them? Who is funding them? From which source of income?
- Do you think you are doing enough to deal with the problem of traffic accidents? How?
- Can you describe some limitations of your authority in combating the problem of traffic accidents?
- What do you think is the best way to approach the problem of traffic accidents in your district?
- Do you collaborate with other stakeholders in combating the problem of road traffic accidents? How?
- How do you associate with central government specifically on road safety issues?
- Do you have any guide or secular in approaching road safety activities in your district? Can you describe what kind of guides they are?
- Do you associate people in your district in approaching the problem of traffic accidents? How are they involved?
- How do you finance road safety activities in your district? Is there a specific budget plan? How is it organised?
- How do you approach the problem of traffic accident if an accident has happened within your district? Can you describe a procedure?
- Is there anything else you would like to say about the issues of traffic safety in your district?

Appendix 6: **Map of Dar es Salaam roads network**



Appendix 7: Map of Arusha roads network



Appendix 8: Map of Shinyanga roads network