



Challenges and Prospects of Traffic Management Practices of Addis Ababa City Administration

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Development Management**

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Practices of Addis Ababa City Administration**

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Declaration

I, the undersigned, declare that this thesis is my original work and has not been presented or submitted partially or in full by any other person for a degree in any other university, and that all sources of materials used for the purpose of this thesis have been duly acknowledged.

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List of Acronyms and Abbreviations

AACG - Addis Ababa City Government

AATB - Addis Ababa Transport Bureau

ACRA - Addis Ababa City Road Authority

BRT - Bus Rapid Transit

CODATU – Conference on the development and improvement of urban transport

CSA - Central Statistic Agency

ERSO - European Road Safety Observatory

ESMAP - Energy Sector Management Assistant Program

ETSC- European Transport Safety Council

GDP - Gross Domestic Product

GTZ - German Agency for Technical Cooperation

ITC - Intelligent Traffic System

LRT - Light Rail Train

MT - Motorized Transport

NMT – Non-Motorized Transport

OECD - Organization for Economic Co-operation and Development

RTA - Road Traffic Accident

TPO – Traffic Police Office

UN-HABITAT - United Nation Human Settlement Program

WHO - World Health Organization

Abstract

Urban transport is very crucial for the movement of goods and people which make the backbone of the economy and sustainable development. However transport system creates some problems like accident, congestion, environmental pollution if not properly managed. Hence, the transport system of Addis Ababa city has shown evidence of traffic problems like accident, congestion, environmental pollution etc. that are created due to improper driving practice of operators, lack of sufficient infrastructure, lack of regulatory framework etc. . Thus, the main aim of this study is to assess the traffic management practice of the city and the challenges that hinder the efficient implementation of the practice considering the existing traffic problem observed in the city. The study also seeks to identify the prospect measures that are planned to be undertake in the future. Both primary and secondary data sources were used to collect data. While, questionnaire and semi-structured interviews were used for collecting primary data, internal documents were reviewed for secondary data .Purposive sampling technique was used to select respondents from Addis Ababa Transport Bureau and random sampling technique was used to select operators of vehicles in the selected area of the city road as respondent. Hence qualitative methods were employed to analyze the data. Accordingly, the study found the traffic management practice of the city is very weak and it is at rudimentary stage. However, there are some initiations which are employed to control the existing traffic problem in the city in terms of engineering, enlightenment and enforcement programs. Thus, those practices are not adequately employed with respect to the magnitude of the problem the city faces like accidents, congestions, parking etc. Therefore the study further seeks for the major problems that hinder the traffic management practices as it is required. Hence it is found that there are various internal and external factors that hamper the undeveloped management practice of the city. These challenges are categorized as internal and external. Thus, not having a defined organization structure, lack of sufficient and competent manpower, lack of operational and implementation resource, not supported by modern technology are the major internal factors. Similarly the practice has some external factors like lack of integration among stakeholders, lack of recognition, weak enforcement capability, and lack of integrated transport planning which distract the efficient practice. Thus based on the findings as a recommendation the requirement for the recognition of traffic management with innovative and responsive policies with city wide power, responsibility and staffing; the need for taking in to account the application of full range of traffic management measure, the need to have a framework (architecture) that describe all step needed to achieve effective traffic management are the major recommendations forwarded by the study.

CHAPTER ONE

INTRODUCTION

1.1 INTRODUCTION

Globally, the rate of urbanization is increasing at an alarming rate with 50% of the world population expected to live in urban areas by 2025 and more transformation is expected in developing countries (World Bank Report, 2003). Despite some economic benefits, the rapid urban growth in these developing countries is outstripping the capacity of most cities to provide adequate services for their citizens (Cohen, 2004). A high urbanization rate in combination with the intense desire for car ownership in developing countries causes a rapid growth of motorization (Gakenheimer, 1999). On the other hand, a lack of infrastructure and weak maintenance exerts extra stress on these growing traffic flows with congestion, pollution and a low road safety level as a result (Rust et al., 2008, Cohen, 2004, Gakenheimer, 1999, Gwilliam, 2003).

Traffic can be defined as the movement of pedestrians and goods along a route. It is the transportation of goods, coming and going of persons or goods by road, rail, air, etc. The need to move from place to place along with its own luggage in making a living is a human character. Such a movement of human beings and goods across a unit of geographical space for day to day activities by any means (foot, animal and/or vehicles is known as 'Traffic' (Goodall, 1987; Mayhew, 1997). This has led to gradual shift of transportation from on-foot to animals and then to vehicle; and even from slower vehicle of the first generation to the fastest vehicles of the 21st generation. Talvitie (1997) says transport in urban area is very crucial because it facilitates the movement of people and goods which marks the backbone of economic growth and sustainable development of a country. According to Bartone et. al. (1994), Cities are the powerhouses of economic growth for any country i.e. around eighty percent of GDP growth in developing countries is expected to come from cities. Thus along with rapid developments in economy, society and level of urbanization, the need for mobility is correspondingly soaring. Therefore, it is imperative to facilitate movements through transport development as it is very crucial in cities for the movement of goods and people and subsequent economic development.

These days, technical progress and changes in lifestyle, including travel, cause inter alia change in human mobility model. This was the cause of the increase in motorization and an increase in the average number of kilometers driven per year. One of the many different effects of the intensification of traffic was the increase in the number of road accidents (Zbigniew&Andrzej,2012). Newman and Jeffrey (1999), highlights the negative effects of urban

traffic as it contributes to accidents, noise and air pollution as well as traffic congestion on the roads if not properly managed. Thus, traffic management should be given importance to improve the movements of people and goods; to ensure efficient and safe access and distribution; alleviate traffic congestion and adverse traffic impacts arising from major land use developments. Traffic management could be regarded as a systematic and sustained effort on directing and controlling all traffics on our roads to make them free from negative effects of the transport system. According to Adebisi (2004), Traffic management is considered as a means of optimizing the available road network in accord with specified objectives as dictated by the prevailing local issues. More recently the emphasis has moved away from simple capacity improvements to accident reduction, demand restraint, public transport priority, environmental improvement and restoring the ability to move around safely and freely on foot and by pedal cycle (Commission of the European Community, 2009).

However, the management of traffic situation would be difficult where there is rapid growth in motorization with less than corresponding improvement in the road network and related facilities, and where there is no well structural pattern of roads, planned growth and organized land-use distribution (Kombs 1988).Hence traffic management arose from the need to maximize the capacity of existing road networks within finite budgets and, with a minimum of new construction. To cope with the situation, it is imperative to ensure proper use of available facilities and develop infrastructure through optimum utilization of resources.

Nonetheless, Cities throughout the world have found themselves at the brink of massive traffic explosion, which curtailing their ability to manage traffic. Knoflacher (2006) says there is a huge increase in car ownership all over the world including the developing countries. Urban planners and traffic managers need to take into consideration this rapid change in traffic so that correct measures will be undertaken to curb the traffic problems. The situation has worsened for developing regions due to unplanned cities, poor discipline, poor traffic law enforcement, lack of alternate traffic means, archaic management, tighter budgets (VipinJainPolytechnicInstitute,2012). In many cities, traffic management has not been effective due to the lack of a strong, professional traffic management agency with adequate regulatory powers and enforcement capacity. The fragmentation of responsibilities between agencies and lack of inter-agency co-ordination coupled with a lack of staff and resources has frustrated the effectiveness of many traffic management schemes (<http://www.thalesgroup.com>).

Moreover, one of the strategies for traffic management is consideration of pedestrians, visitors and occupants of the city. Thus participatory approach is very crucial if traffic management programs are to be effective. Urban areas are associated with economic activities and hence the policies of cities tend to be political since they serve the interests of a particular group. In most cases these policies are just imposed to the people. There is, therefore, need for stakeholder participation on issues of traffic management for effective implementation of the policies (Fungai and Virginia, 2013).

1.2 BACKGROUND OF THE STUDY

Having a growth rate of 2.1% the population of Addis Ababa constitutes 32.27 % of the total urban population of the country (CSA, 2010). In year 2012 the total population of Addis Ababa reaches 4 million and expected to be reaching 6million and 10million in the year 2025 and 2040 respectively .And the city has an area of 540 km². Thus the increase in population size coupled with the economic growth and increase in the size of the city demands a transport service supply in line with the increase in the mobility need of the people. Therefore compatible urban transport supply and effective management to meet the increasing trip frequency and mobility needs of the people and goods has become a challenge for the city. Among the challenge of the urban transport; poor access to work place, education, health and other services due to lack of public transport service; continuous increases in transport fair especially for low income Groups; lack of smooth traffic flow; lack of infrastructure for None Motorized Transport (NMT) (for walking and bicycle); high rate of traffic accidents, increasing air and noise pollution are the major ones identified by the Addis Ababa Transport Bureau. And although transport problem are becoming critical improved traffic and transport system development are essential for the city.

Addis Ababa road and transport bureau was established through proclamation no 15/2009 GC. With the aim to make the city resident to be the users of modern, secured and fair public transportation. The bureau is established with a mission to ensure the city to have modern, secured, fast and reliable transportation services which fulfill the city residents' transportation desire and movement proportionally with fair price.

Hence in order to clearly identify the city transport challenges, to indicate clear direction and identify measure to be taken to optimally utilize the positive experience and to take the necessary measure to solve the complex problem in the transport sector, Addis Ababa Transport Policy is formulated in 2011.

1.3 PROBLEM STATEMENT

Addis Ababa, the capital city of Ethiopia, is characterized by the largest share of road traffic flow comparative to other cities in the nation. As a result, the majority of road accidents, congestion and related traffic problems are highly concentrated in the city. Data revealed by Addis Ababa City Administration states that from the total 46,897 passenger vehicles in Ethiopia, more than 56.1% are found in Addis Ababa (Addis Ababa City Government, [AACG], 2010) similarly, the rate of traffic accidents and pollution in Addis Ababa goes up together with the increase of motor vehicles and population size. Among the many causes, road accident is identified to be the major cause of death for economically productive portion of the population in Addis Ababa (Fanuel, 2006). On the other hand, the daily movement of people and freights within the city is becoming more difficult and complex. This is reflected in the increasing bumper-to-bumper traffic. Now days it seems that traffic congestions are becoming forcefully acceptable excuses for workers being late to work in the capital. The poor road infrastructure of the city, coupled with inadequate and inefficient transport activities, the erratic behavior of drivers and sudden surge in the car ownership have combined to complicate Addis Ababa traffic problems. Thus, traffic cannot flow efficiently and the overall result is the clogging of the city metropolitan roads. Yet among the various reasons of major traffic problems in the city the weak traffic management is identified as a major one by different scholar studies in the area (Fanuel,2006, Getu,2007,Ajay and Fanny ,2008).

Different scholars on the area studied the traffic problem nature causes and its impact in the city. Bitew (2002) studied the causes, temporal and spatial variations and consequences of taxi traffic accident, Tessema et al (2005) focused on developing adaptive regression trees to build a decision support system to handle road traffic accident analysis. Fanuel (2006) on his part tried to identify major causes of traffic crashes, concluding that there is growing problems of road accidents, and forwarded traffic simulation model for network selection. While Tewelde (2007) tried to identify variable that most cause road accidents, UNECA (2009) analyzes the trends, causes and characteristics of accidents. As could be seen from the above examples, almost all of them are concentrated on assessing usual causes, consequences and spatial and temporal characteristics as well as application of some models. However, none of these were devoted to assess and identify the traffic handling mechanism and arrangement practiced to curb the traffic problem in the city. Globally however different kinds of traffic management measures have been practiced and researched showing their potential in dealing with congestion, accident and other traffic related

problems. However, the traffic background in Addis Ababa is very different from other cities of the world; the traffic problems as well as the practice to manage it thus are not likely to be the same.

This study, therefore, intends to fill the identified gap, by reviewing the practices of traffic management in the city so as to find out the challenges and prospects faced by the concerned bureau in its efforts to reduce road traffic problems and to evaluate the constraints encountered on implementing and execution of the traffic management practice.

1.4 RESEARCH OBJECTIVES

1.4.1 General objective

The main objective of the study is to examine the general ‘Traffic Management’ practices of Addis Ababa with particular reference on the efforts to reduce road traffic problems and the challenges encountered on implementing and execution process.

1.4.2 Specific objectives are:

1. To review the existing road and traffic condition of Addis Ababa,
2. To evaluate the existing traffic management arrangements being practiced in the city,
3. To identify the factors that hinder the efficient and effective management of traffic in the city;
and
4. To identify the prospect of traffic management practice of the city.

1.5 RESEARCH QUESTIONS

1. What is the existing road and traffic condition in the city?
2. What are the major traffic problems in the city?
3. What traffic management measures and alternatives are employed to alleviate the road traffic problems in the city?
4. What are the major challenges that hamper the traffic management operational activities in the city?
5. What policy direction and program are considered to sustain city short, medium and long term transport and traffic management plan?

1.6 SIGNIFICANCE OF THE STUDY

Success in traffic management directly influences the efficiency of the transportation network, the economic competitiveness of a city, and the quality of life for the communities. Hence, the goal of this research is to provide an updated and comprehensive scan of current practices in traffic

management operations for institutions concerned with road traffic management and municipal authorities. The study will also help to improve the quality of decision-making in urban road transport management planning, to determine the need for road improvements, vehicle inspections and to initiate programs for educational purposes. Even though the study is carried out for academic purposes and it is confined to a single city, it could be helpful to have a deeper knowledge about the complexity of traffic management practiced in the city.

Furthermore, the findings obtained from the study will be helpful to gain information and knowledge about the patterns of road traffic in the city, which in turn, could help to develop countermeasures that could reduce the related traffic problem in the city.

In addition, the result of the study is expected to generate important findings that can help as useful input for further research to refine the conceptual and methodology of the present study.

1.7 SCOPE AND LIMITATION

1.7.1 Scope of the Research

The study conducted in particular context of the Addis Ababa city and focused only on the city's traffic management practice. Further the study focuses on traffic management for land transport by giving special emphasis on road transport model i.e. vehicles by excluding the management of traffic in the aviation and water board sectors.

Traffic management broadly comprises the operational, technical, administrative, and engineering measures which contribute towards the smooth flow of traffic in the city. In this study therefore, the operational, technical and administrative measures will be addressed while engineering aspect will not be studied in depth.

1.7.2 Limitations of the Study

The most constraints of this study include:

- Difficulty in gaining access to relevant information that pertains to the study.
- Failure on the part of respondents to complete the questionnaires that administered to them.
- Illiteracy and ignorance on the part of the respondents was another factor that hindered progress of the study.
- A time constraint was also a limiting factor.

Despite all these limitations the study states the findings by remaining unbiased.

1.8 ORGANIZATION OF THE PAPER

The study is divided into five chapters. The first chapter covers background of the study, statement of the problem, objective, significance, scope and limitation of the study. Literatures by referring to various relevant books, publications and other related literatures concerning traffic management practices were reviewed in the second chapter. The third chapter covers the methodology and method used in the study. In the fourth chapter, data gathered through questionnaires, interviews and other literatures are presented and analyzed and finally based on the finding the conclusions and recommendations has forwarded in fifth chapter. A list of references follows chapter five.

CHAPTER TWO

LITERATURE REVIEW

The purpose of this chapter is to give a general theoretical framework about the topic; it also aims to present general facts of previous findings, ambiguity and arguments about the concept that has been researched.

2.1 URBAN MOBILITY AND TRANSPORT SYSTEM

Mobility is a precondition for the social and economic development of society. It is an important factor in our lives, whether that is on the way to school, work or to the shops, or whether it concerns the delivery of goods. For all these activities, we travel in different ways – by foot, bike or car, or bus. GTZ (2009) states that mobility is a basic condition for participating in working life, for engaging in social, cultural and political activities, and for availing educational opportunities. Mobility flows are a key dynamic of urbanization, with the associated infrastructure invariably constituting the backbone of urban form. Urban mobility systems aim to provide access to basic goods, services and activities to enable people to participate in civic life (UN HABITAT 2013).

The issue of urban mobility has always taken centre stage in national and international forums all over the world. So also are attempts at increasing and enhancing the mobility of human and vehicular traffic within and around metropolitan cities. The issue of urban mobility has become paramount because world cities are increasingly under pressure of population growth (Shrank, Lomax and Eisele, 2011). Urban mobility has therefore been described as the revolutionary ways of moving people; and also a social cause that brings neighborhoods and communities together, reminding us that we are part of a global villager (Lerner, 2011).

An enhanced urban mobility system is dependent on an efficient and effective urban transport systems and networks which can significantly contribute to achieving global, national and regional objectives through a wide range of policy domains (Jewell, 2012). The success of policies and policy objectives on urban mobility and transport systems impacts on socio-economic objectives and also serve as an important facilitator for growth, employment and sustainable development.

The beauty of metropolitan and urban cities all over the world lies in the availability of social infrastructures which makes life meaningful to its dwellers. Social infrastructures like good network of roads and transportation system not only make urban dwellers live life with ease within the city and its environs but also provide opportunities for the mobility of people and goods and over a long term influences patterns of growth and the level of economic activity (Meyer and Miller, 2001). This

urban development dynamic necessarily generates new mobility needs and this Mobility requirements will increase with the growing population and must be met more efficiently (CODATU XV, 2012).

Transport networks are intended to move people and goods to where they need to go quickly and affordably (Sohil, Maunder and Cavill,2006). The movement of people and goods is affected by cost and the safety of travel. Increasing the efficiency and effectiveness of transport network will increase mobility (Znidgeest, 2005). Globally, the transport bias of urban mobility is demonstrated by the dominance of motorization, particularly private cars as the preferred means of mobility (UN HABITAT, 2013). In 2005, nearly half of all urban trips were made by private motorized modes, primarily due to the meteoric increase in the number of motor vehicles. By 2035, the number of light-duty motor vehicles – cars, light trucks and mini-vans – is projected to reach nearly 1.6 billion. Moreover, a redistribution of the ‘global travel pie’ is unfolding as developing countries are responsible for this increase (UN HABITAT 2013).

2.2 ROAD TRAFFIC PROBLEMS

Urban traffic faces many challenges which are mainly caused by rapid urbanization and an increase in car ownership which then influence both the flow of traffic and the environment. The main challenges are traffic congestion, pollution and road accidents Knoflacher (2006). Similarly, Newman and Jeffrey (1999), highlights the negative effects of urban traffic as it contributes to accidents, noise and air pollution as well as traffic congestion on the roads. Traffic also contributes to global warming through the gases which are emitted.

The increase in car ownership means also an increase in the number of trips per person per day. This continuous movement of people causes more traffic jams and more parking spaces will be used during the process. According to Vuchic (2005), cities are dynamic hence there is also need to constantly modify transport systems in order to cope up with the changes. Road transport costs arise from the external effects of traffic system, particularly accidents, congestion, consumption of public space, air pollution, noise, and disruption of social and economic interaction (WHO, 2000). These externalities of traffic are especially pertinent in urban areas because here spatial densities are high and the infrastructure networks are most intensively used.

The current status of road traffic in many countries is extremely unpleasant. Road traffic is dangerous, expensive and has a high pollution rate. Accidents injure or kill thousands of people

every year Eurostat (2009). Traffic congestion in many big cities has gone almost out of control. Environmental damage is another issue. CO2 emissions from transportation in general and road transportation in particular have been rising faster than emissions from all other major sectors of the economy (Eurostat ,2009).

2.2.1 Traffic Problem- Congestion

Although there is traffic congestion in most major cities of the world, there is no standard definition of it. In general, congestion occurs when the number of vehicles using the road is greater than the capacity of the available road space, impeding the efficient movement of traffic (Weisbrod, Vary, et al. 2003).

Rodriqueet.al, (2009) state that, congestion can be perceived as unavoidable consequences of scarce transport facilities such as road space, parking area, road signals and effective traffic management. They argue that urban congestion mainly concerns two domains of circulation, passengers and freight which share the same infrastructure. Thus, traffic congestion condition on road networks occurs as a result of excessive use of road infrastructure beyond capacity, and it is characterized by slower speeds, longer trip hours and increased vehicular queuing.

Downie(2008) also opines that traffic congestion occurs when the volume of vehicular traffic is greater than the available road capacity, a point commonly referred to as saturation. He describes a number of specific circumstances which cause or aggravate congestion. Most of such circumstances are concerned with reduction in the capacity of road at a given point or over a certain length, or increase in the number of vehicles required for the movement of people and goods. Downie (2008) further argues that economic surge in various economies has resulted in a massive increase in the number of vehicles that overwhelms transport infrastructure, thus causing congestion on roads in cities.

Rodriqueet al. (2009), note that congestion in urban areas is dominantly caused by commuting patterns and little by truck movement. They further attributed the causes of congestion to rise in population densities, road incidents and broken vehicles on the roads which restrict capacity of roads and impair smooth traffic flows. Another contributing factor to congestion as suggested by Herman (2001) cited Downie (2008) is parking. He is of the view that road parking, which consumes large amount of space has become a land issue that greatly inflates the demand for urban land, causing congestion in cities. He adds that high urban mobility rate also contributes to the congestion menace.

The massive use of cars does not only have an impact on traffic congestion but also leads to decline in public transit efficiency, thereby creating commuting difficulties in cities. Indeed the over-dependence on cars has tremendously increased the demand for transport infrastructure. Unfortunately the supply of transport infrastructure has never been commensurate with the growth of mobility needs. Consequently, several vehicles spend most of the time in traffic as a result of traffic space limitation (Yan and Crooks 2010).

Furthermore, traffic congestion in urban road is attributable to limited road capacity, parking space, dysfunctional road signals, drivers' behavior, vehicle breakdown on roads and too many cars within the city (Takyi ,Kofi ,Anin, 2013).

Downs (2003) also argue that the mingling of many different modes of movement on the same roads as a cause of congestion in developing nations. The mix of old and new transport technologies, highlighted by the shared use of road space by fast moving motorized vehicles and slow-moving human-powered and animal-drawn vehicles (such as rickshaws, hand drawn carts and animal drawn vehicles), typifies many street scenes of the third world (Rietveld, et al., 1990). It is obvious that a road hosting several kinds of travelers such as vehicles, buses, motorcyclists, bicyclists, even horse drawn carts can't have a high efficient traffic flow, since the faster travelers have to adapt to lower speed travelers.

2.2.2 Traffic Problem-Road Traffic Accidents

Road traffic accidents (RTAs), here defined as *“An accident that occurred on a way or street open to public traffic; resulted in one or more persons being killed or injured, and at least one moving vehicle was involved. Thus, RTA is collisions between vehicles; between vehicles and pedestrians; between vehicles and animals; or between vehicles and fixed obstacles”* (Persson2008). According to (World Health Organization (WHO), 2009)report some 1.3 million people are killed each year in road crashes and a further 50 million people are injured. These numbers are likely to almost double by 2030 unless action is taken. The number of accidents per registered vehicles was 10% to 20% higher in developing countries than in the developed world. A prevalence of under-reporting of serious crashes, notably in low-income and middle income countries, means that the actual number of deaths is likely to be much higher than that reported in individual countries (WHO, 2009).

Road traffic accidents are a major worldwide problem. In developing countries the trend has reached an alarming state, but very little attention is paid to the problem (Odero et al 1997).

The more general reasons advanced by these researchers for an increase of accidents in developing countries were; Rapidly urbanization process, high growth rates of traffic, poor road conditions, reckless driving, non-adherence to the traffic regulations by the motorist and the traffic officers (due to corruption). The majority of people in developing countries were dependent on public transport for their daily movement. Causes of motor vehicle crashes are multi factorial and involve the interaction of a number of pre-crash factors that include people, vehicles and the road environment. Human error old vehicles, overloading, lack of safety belt, helmet use, poor road design & maintenance and the traffic mix on roads are other factors that contribute to the high rate of accidents (Zulfigar et al. 2012).

As current cities of the world have been experiencing high level of motorization and threatened by the lack of sustainable transport development (Kennedy et al, 2005), serious attention must be given to the issues of urban transport.

2.2.3 Traffic and the Environment

The transportation of people and goods marks the backbone of economic growth and sustainable development and hence the environmental effect of traffic is usually neglected as it is viewed as a threat to economic growth. Sustainable development is also based on the environment being it natural or man-made environment. Traffic movement is characterized by the demarcation of urban activities in terms of land use as people tend to live away from work, services and other urban facilities. This now prompts the movement of traffic and hence it influences the health, safety and attractiveness of the urban environment (Talvitie, 1997).

Urban agglomerations are major sources of atmospheric pollution and road traffic is the main source of air pollution in cities (Molina and Molina, 2002; Moussiopoulos, 2003; Vivanco and Andrade, 2006). Fuel which is mainly used for automobiles is usually liquid and this has effects to the environment after combustion. Air pollution is one of the major impacts of traffic to the environment. Motor vehicle emissions are not regulated yet they contribute immensely to the pollution of the environment. Exhaust fumes affects the composition of the air and they contribute to the destruction of the ozone layer hence leading to global warming.

Increase in urban transport increases the level of air and noise pollution. UN-Habitat (2006) also emphasizes the effects of traffic on environmental pollution in cities and towns which is a health hazard to human beings and animals. Pollution will undermine the use of resources for the benefit of future generations.

Another major concern of urban traffic is noise pollution. According to Mirrilees et al (1996), noise is defined as unwanted or excessive sound in the wrong place and at the wrong time. Noise can be annoying and interfere with activities like work, studying, recreation or even sleeping. Too much of noise has got psychological effects. The major source of traffic noise is moving vehicles, construction and transportation vehicles, and vehicles in bad operation state. Much of the noise is mainly caused by the direct connection of the roads to the commercial areas, industrial areas and offices. The increase in the amount of traffic results in the increase in the amount of noise generated.

Basically two approaches can be applied in order to solve or at least minimize the above stated traffic problems. The most straightforward solution is to build more infrastructures, such as bridges, roads and viaducts, in order to increase capacity. This solution is no doubt useful, especially for decreasing congestion, but it is not sufficient (McQueen and McQueen, 1999). Constructing new road infrastructure is limited due to environmental, social and financial constraints (Mc Donald M., et al. 2006). With difficulties of building more infrastructure and the aforementioned transportation problems, an approach in which already existing road capacity is better used is welcome. This second approach to traffic related problems is to control traffic by deploying Road Traffic Management Systems (RTMS), which contribute to efficiency as well as safety and environmental improvements (Soares, Vrancken and Wang, 2010).

2.3 DEFINITION AND CONCEPT OF TRAFFIC MANAGEMENT

Traffic management could be regarded as a systematic and sustained effort on directing and controlling all traffics on our roads to make them free from negative effects of the transport system (Asiyanbola, Osoba, and Adewale, 2012). Gardner et al (1989) pointed out traffic management is an application of traffic engineering and administrative techniques in order to optimally use of the existing infrastructure. Adebisi (2004) also describe traffic management as a package of actions designed to optimize the available highway network in a well-focused manner. Newman and Jeffrey (1999) express traffic management as process of adjusting or adapting the use of an existing road system to meet specified objectives without substantial new road construction. Traffic management can increase the capacity of road networks at much lower cost than new road provision by increasing the efficiency of network use (Goodwin et al, 1998).

Traffic management is the influencing element of the traffic situation by a bundle of measures with the target of harmonizing the traffic demand and the traffic supply of all transportation modes. And it aims to safeguarding and improvement of the citizen's mobility, safeguarding and improvement of economic transactions, improve the transportation compatibility with the environment and society , better use of existing infrastructure, increase traffic safety and comfort, decrease of pollution, reduction of traffic jams and increase of public transport (METRASYS 2012).

John (2000) on his report of experience in Urban Traffic Management and Demand Management in Developing Countries stressed that traffic management involves the allocation of infrastructure (road space or train slots on a railway network) according to strategic operational and policy goals. These include efficiency, safety, environmental, economic and equity objectives. In real terms, meeting them may encompass measures that include giving priority to buses, trams or other vehicles such as emergency services or high occupancy vehicles, increasing space available for pedestrians and cyclists, or providing shared road space. Thus, road-related traffic management has considerable benefits in improving traffic flows, increasing safety and improving services to road users, for relatively little cost compared to that of building new infrastructure. Traffic management'' embodies a wider concept and is concerned with the comprehensive management of the road based transport system and deals with policies and measures for the entire urban transport system (John, 2000).

Thus experience in developed and well managed developing cities shows that traffic management is an essential element of any city transport strategies, fundamental to realize the potential of more costly transport infrastructure and system investments; and low costs but exceptionally high beneficial system. Traffic management is used to curb demand for transport and affect the selection of the mode of transport, route, or the time of travel or transport (Martin, 2006). Even in modern societies with well-planned road management. Traffic management and control approaches are used to control the traffic flows and to prevent or reduce traffic jams, or more generally to improve the performance of the traffic system as an alternative approach for more efficient use of the existing infrastructure (Baskar, 2009).

Eddington (2006) cites adequate transport network, traffic management and control system and effective, efficient and reliable mass transit as key factors that affect urban transportation system. Nadiri (1998) postulates that investment in adequate transport infrastructure improves transport efficiency in terms of increased productivity and continue that transportation infrastructure involves

good road network, adequate bus stops, parking areas with traffic signals. Shapiro et al, (2002) assert that Effective traffic management and control system is a key to ensuring effective transportation system in the urban areas. This involves management and control of road signals, road space, parking space and road users (Arasan 2012; Jones 1999).

John (2000) pointed out that Traffic management is highly city-specific and depends on level of city size, development, levels of traffic congestion, traffic characteristics and thus measures which are successful in one city may not be appropriate or successful in another; and it can be applied over an area (say, a corridor or a local area or a town centre or the whole city) to develop a consistent traffic management regime and its interventions should not be regarded as “stand alone” measures; that is it should seek to balance often conflicting objectives and thus needs to combine individual interventions (in traffic, public transport, pedestrian schemes) to form effective, “comprehensive packages”. Traffic management comprises both “supply side” measures—traffic system management to improve speeds of existing traffic volumes—and “demand side” measures—traffic demand management to improve speeds by reducing traffic volumes (ESMAP, 2002).

2.4 TRAFFIC MANAGEMENT TECHNIQUES

Traffic management measures are those actions that can be implemented to enhance the person-carrying capability of the roadway system, without adding significantly to the width of the roadway and include a range of strategies (AfriTest, 2012). Traffic management measures should be set within a defined traffic and regulatory policy and are most likely to be combined into comprehensive packages which will vary in type and extent in accordance with the function of the relevant road in the hierarchy (John, 2000).

The primary emphasis of traffic management measure is on the safe and efficient flow of vehicles over urban streets and highways. The means of promoting this can vary from simple improvement of local streets by installing traffic signs and road markings to constructing comprehensive motorway control systems. Such comprehensive systems use access-road meters to monitor and control motorway access; closed-circuit television surveillance to detect quickly any deterioration in traffic flow; and emergency services to provide aid in case of accident and injury. Other traffic-control techniques include the use of one-way streets, enforcement of traffic flow regulations, chenalization (building traffic islands, turning lanes and so on), and the use of traffic signals (Meron2007) .

Traffic signs and road markings follow a uniform practice throughout the world and are designed to convey information with a minimum of words to avoid confusing drivers unfamiliar with the area and the language. Uniform pictorial signs and markings have been adopted throughout Europe and the United States (Meron, 2007). They include uniform sign formats and sizes, and uniform codes regulating traffic flow. Traffic signals are installed to permit safe movement of vehicles and pedestrians at busy intersections. In recent years, greater attention has been paid to the efficient movement of public-transport vehicles and the sharing of cars. These aims are being accomplished in several ways. Specially marked traffic lanes may be reserved for buses and, in some cities, for cars with more than one occupant; city-centre streets may be reserved exclusively for buses; certain types of vehicle may be given priority access to motorways and traffic-signal systems that detect and favor buses may be employed. The overall use of highways may be restrained by road pricing, in the interests of reduced air pollution and congestion. (Meron, 2007). Similarly Institute of Transportation Engineers (2000) classified Traffic management measures in to three broad terms as: Traffic Signalization which encompass (equipment or software updating, timing plan improvements, signal coordination and interconnection, Signal removal); Traffic Operations (Converting two-way streets to one-way operation, two-way street left turn restrictions, continuous median strip for left turn lanes, channel zed roadway and intersections, roadway and intersection widening and reconstruction; Enforcement and Management (enforcement for all of the actions, incident Management system, ramp metering).

Traffic management measures according to Adebisi (2004) involves, a package of actions designed to optimize the available highway network in a well-focused manner. The package of action comprises a variety of techniques for dealing with traffic related issues. Adebisi points out among the relatively inexpensive techniques available for developing comprehensive traffic management practices that could be applied for efficient use of the available traffic infrastructure in the area are Road capacity, traffic sign (i.e. pavement markings, road sign, etc.), Guard rails, cross marking etc traffic calming, vehicle parking regulations and controls, pedestrian measures, accident reduction programs, bus priority measures and application of Intelligent Traffic System (ITS). So for effective traffic management the aforementioned traffic management techniques can be applied, this will enable them make efficient use of the available traffic infrastructure in the area Adebisi (2004). Another technique /measure pine point by many scholars for effective and efficient management of traffic in the road are "Educational, Enforcement and Engineering measures".

Education is regarded as a “soft” approach to promoting desirable (from a road safety perspective) road use because, rather than placing external constraints on the individual (as is the case with enforcement and engineering interventions), it relies on persuading people to adopt appropriate behavior (Sentinella, 2004). Empirical evidence for the impact of road safety education on road user behavior does exist. In the case of drivers, some studies have found that road safety education interventions can promote desirable attitudes and behaviors (Meadows & Stradling, 1999; Millar & Millar, 2000; Stead et al., 2002).

Road users are required to be made aware of the basic rules of the roads. Through various communication measures such as exhibition, posters, lectures and advertisement through radio, TV and Newspaper a common sense regarding traffic norms is to be instilled in the public. Government, schools and voluntary organizations can implement this communication strategy (Harlandh and RS, 2002).

Enforcement of traffic regulations is exercised by Police and Road Traffic Office staffs Harlandh and RS(2002) in their study of problem and possible solution for better traffic a management of smooth traffic flow, suggest fine, vehicle detention and cancellation of driving license force the road users to strictly follow the traffic rules and regulation.

On the Engineering measure – both Harlandh and RS (2002) and Seth (1982) stressed the need for good construction and preventive maintenance facilitates for better traffic management. This is focused on the role timely repair of the road, putting sign boards wherever required, removing billboards that distract and pruning trees along the highway are the major constituents of this part. As a common system Aldona (2010) indicated for better implementation of well-organized and safe urban, traffic management measures should be implemented based on:

- Category and function of the street;
- Forecast traffic intensity and the structure of transport flows;
- General concept of traffic organization;
- Results of traffic organization solutions impacting concrete groups of traffic participants;
- Adjustment of traffic organization solutions to the needs of people with reduced mobility (disabled persons);
- Increased traffic safety on streets;
- Protection of urban sensitive objects from intense transport flows (Aldona, 2010).

2.5 THE ROLE OF TRAFFIC MANAGEMENT ON CURBING TRAFFIC PROBLEMS

The principal focus of traffic management and control systems is to ensure the safe and efficient movement of traffic on roadways. This is indeed a challenging task since incidents, of varying degrees of magnitude, can routinely impact the flow of traffic. These incidents need to be identified, and responded to in a timely fashion.

John (2000) stressed that urban traffic management use to make the most productive use of the existing road based transport system by adjusting, adapting, managing and improving the system. Specifically, traffic management is designed to improve the movement of people and goods; to improve the quality and safety of the traffic and transport system; and to contribute to the improvement of the urban environment. Traffic management can assist poverty reduction by improving travel for "people" and it also improves the flow of traffic and enhances mobility, thereby reducing emissions and fuel consumption.

Institute for Transport Studies (2010) describe the benefit of traffic management in two perspectives i.e. for the public and individual. Hence the public will profit from the measures because the road infrastructure is used more efficiently through traffic management, congestion can be addressed and, thus, negative impacts of traffic (e.g. pollution, noise, accidents) can be reduced. This is possible without investing in new road infrastructure. If breakdowns occasionally occur in the transport network or large scale events are taking place, traffic can be re-routed accordingly. Unnecessary mileage driven searching for available parking spaces is reduced. Access and parking management measures can be enforced more efficiently and, therefore, the positive effects of these actions will be enhanced. Also the reliability and the quality of service of public transport can be improved, affording passengers time savings. Furthermore, the road safety can be improved when dangerous locations and situations that can cause accidents are identified and improved with the help of the tools described. And Individuals can benefit from less congestion and reduced travel times effected by the improved traffic management. Fewer people are injured in traffic accidents, reducing personal harm and associated costs.

2.5.1 Traffic Management and Safety

Traffic management and traffic safety are integrated. The traffic safety management is implemented appropriately otherwise will influence traffic safety. Road safety management implies systematic work to ensure continuous improvement in road safety (Elvik, 2008), or acting to prevent accidents

and to mitigate the consequences of those that still occur (ETSC, 2006). The need for effective road safety management is widely recognized today due to the global burden of road trauma for society and public health; preventability of major parts of road fatalities and severe injuries, and the availability of knowledge on measures and interventions that can be applied to achieve the results (WHO, 2004; ERSO, 2008).

The traffic safety management refers to the construction and maintenance, management of the vehicle, establishment and execution of the regulation of the road, training and management of the driver, traffic participants' understanding of traffic rule, etc. It is a comprehensive and social system. It involves such a lot of departments as the construction, planning, finance, transportation, law, propagating and educating, etc, and any organizations or departments cannot take over independently. So the project of the traffic safety management should be proposed an authoritative to lead organ to coordinate various kinds of strength of the society in unison. The main content of the traffic safety administration management includes flexible ability, communication means, police strength's allocating, technical equipment, team's quality training and organization structuring, etc. (Hu Qionghong et.al. , 2005)

There are also more general fields of concern which bring the focus on road safety, e.g. sustainable economic and urban development, questions of social security and safety, reliability of road transport and disruptions caused by accidents, etc (ETSC, 2006). All the concerns together hold essential value for road safety and increase the social demands for actions.

There is wide acknowledgement that road safety needs a systematic, planned management response (Peden, 2004; Bliss & Breen, 2009; OECD, 2008; Hartzell, 2011; ETSC, 2006). They recognize that limits to improved road safety performance are shaped by a country or organization's road safety management system which determines the road safety results being sought and produces the interventions and organizational management capacity needed to achieve them (Bliss & Breen, 2009).

The traffic safety management involves the traffic safe administration management (the mechanism, traffic safety policy, traffic safety duty of the traffic safety management), traffic safe practice (driver's physiology and psychology, etc, vehicle safe practice, traffic crash analysis and countermeasure) and road traffic safety facilities (road safety facilities, rescue and aid in vehicle safety facilities, traffic participant's safety facilities, safety education of the traffic), etc (Wang, W. et al. 2003).

John (2000) states that , comprehensive urban road safety policy requires a multi-sectoral approach including programs for driver training and testing, education, publicity programs aimed at selected groups of road users, vehicle roadworthiness testing, securing funds for road safety actions, community participation and monitoring and research. Some form of multi sectoral "Traffic Safety Committee" is required to initiate and co-ordinate safety policies and accident reduction programs. While a comprehensive safety program is broader than traffic management alone, traffic management actions should be an integral and important part. He also indicates that, the traffic management aspects of a safety program are likely to include actions in the following areas: accident reporting, accident data analysis, accident prevention, accident reduction, traffic regulation enforcement (John, 2000).

The jurisdictional road safety management system and related assessment framework has evolved over the last decade from work in New Zealand and Europe. It is used widely by the World Bank and has been adopted by the OECD. Both organizations recommended its use. In this model, road safety is produced just like other goods and services and the production process is viewed as a management system with three levels: institutional management functions which produce interventions, which in turn produce results. Consideration of all elements of the road safety management system and the linkages between them becomes critical for any country or jurisdiction seeking to identify and improve its current performance levels (Bliss & Breen, 2009; OECD, 2008).

An overview reports on road safety management (OECD, 2008; ERSO, 2008; Bliss & Breen, 2009) emphasized the point previously made by some researchers (Muhlrad, 2005, Mulder & Wegman, 1999) that the limits of improved road safety performance are shaped by the capacity of the road safety system operating in a country. This system determines the results being sought and produces the interventions to achieve them. The limits of a country's road safety performance are constrained by its institutional capacity to implement efficient and effective interventions, and the subsequent results may fall short of what is technically feasible with any particular set of road safety interventions.

2.5.2 Traffic Management and Congestion

There is no absolute solution to fully eradicate traffic congestion problem from the society as it is fully related with individual land use pattern and existing transport policies to each urban region. Congestion coexisted with the economic activity and hence fully eradicating roadway congestion is neither an affordable, nor feasible goal in economically dynamic. However, a well framed process

addressing the all aspects of congestion is required for long term benefit. According to ECMT (2007), the process should address four broad aspects which are; understanding what congestion is and how it affects the urban region, developing and monitoring relevant congestion indicators, intervening to improve the reliability of urban travel, to release existing capacity or to provide new infrastructure and, perhaps most importantly and managing demand for road and parking space consistent with a shared vision on how the city should develop. Many literatures (e.g. Ramón, 2000 & Hon, 2005) have systematically classified congestion management measures into two groups, namely supply-side measures and demand-side measures. On the basis of this classification, common management measures for relieving congestion are described underneath.

A. Supply-side Management

Engineering theory of traffic congestion concentrated on increasing the traffic capacity of road links, junctions, and whole urban networks by restrictions on parking, pedestrians, access, and even public transport, as well as new road construction (Thomson, 1998). European Conference of Ministers of Transport, ECMT (2007), proposes some supply side congestion management measures which are; improving traffic operations, improving public transport, implementing mobility management, modifying existing infrastructure etc.

Improving public transport

Improving public transport is an important supply management strategy of the transport system for congestion mitigation as it ‘can transport more people than individual cars for a given amount of road space’ (ECMT, 2007). This can be done in various ways; cities can construct additional mass transit networks. Or, some road lanes are provided for public transport use, such as bus lanes, in order to save more time for public transport users (Hon, 2005). By promoting public transport, it can take lone drivers out of private vehicles and make more efficient use of road space, thereby relieving congestion problems (Hon, 2005). However, literature (Downs, 1992; Black, 2003; Hon, 2005; ECMT, 2007) suggests numerous ways of improving public transport such as; Developing mass transit, bus lanes/High Occupancy vehicle (HOV) lanes, better public transport services, more peak and ride facilities, extending services, adopting fee structures, operational improvement, public transport information provision etc. But these measures come at a cost and, alone, will likely not be a sufficient congestion management response (ECMT, 2007).

Improving Traffic Operation

According to, European Conference of Ministers of Transport, ECMT (2007), typical congestion mitigation measures include planning and coordination of road-works, speedy response to defective

traffic signals and to disruptions caused by accidents and debris. These approaches can be very attractive as they can rapidly deliver perceivable benefits to road users for a relatively small investment – especially when compared to the cost of new infrastructure whose impacts on overall travel times may not always be perceived by road users. Efficient and coordinated traffic control systems, can timely adjust the road capacity to accommodate additional traffic and reduce unnecessary travel delays (Hon, 2005). Improving traffic operation typically consists of use of traffic signals, implementation of contingency plans, provision of real time traffic information, pre-trip guidance, monitoring and management of traffic flows (Judycki et al., 1992; Black, 2003; Hon, 2005; ECMT, 2007).

Mobility Management

There are numerous mobility management strategies that can, when successful, reduce car use in urban areas. These include ride-sharing, promoting bicycling and pedestrian travel or supporting mobility management efforts targeting large trip generators such as companies (ECMT, 2007)

B. Demand-side Management Measures

Demand-side congestion management measures are also important for relieving congestion problem as it reduces the demand for vehicle use. ECMT (2007) suggested three related demand side management approach; access management, parking management and pricing policies. ECMT (2007) also suggested ensuring that land use planning, and the community objectives it embodies, is coordinated with congestion management policies. Access management and parking management are regulatory measures and pricing policies are economic measures. So, ECMT actually describes three aspects of demand side congestion management; economic, regulatory and land-use. These three aspects are also described by Hon (2005) as effective demand side congestion mitigation measures.

Economic Measures

Economic measures are important demand side management measures which can alter human behaviors to avoid congestion. Various economic measures are found through literature search such as; taxation (Disincentives), subsidies (Incentives), mixed use tool roads, cordon charges, road tolls, congestion pricing/ Tax, area licensing scheme, electronic road pricing, cordon charges, linked based pricing system etc.

To restrain traffic growth, taxation measures, known as financial disincentives, are used. These taxes are often imposed on vehicle ownership, including car purchase tax and annual registration

tax, and on vehicle use, such as taxes on fuel and parking fees (Potter et al., 2003). Imposing such taxes not only raise government revenue, but it also discourages travelers not to use their vehicle (Hon, 2005). On the other hand, to assort with taxation, subsidies, known as financial incentives, are also used. These subsidies are often payments made for financing public transport operation and developing environmental friendly transport modes, such as cycling (Button, 1992). All have proven to be effective measures to reduce congestion and manage traffic (ECMT, 2007).

Road pricing or congestion pricing is an important economic measure for relieving congestion. It is a tax on road infrastructure imposed on all drivers and it can directly reduce drivers' incentive to use roads. It encompasses road tolls (development levies) and congestion pricing (congestion tax) (Hon, 2005). Where the revenues raised are channeled into transport investments, congestion charging can help provide funds for undertaking priority transport investments (e.g. in public transport, ITS infrastructure or road expansion)(ECMT, 2007).

It is therefore important to plan complementary measures such as the modification of road infrastructure and traffic operations management. Parallel measures such as investments in public transport can also be employed to make pricing more acceptable and also fairer for people who cannot afford the charges or tolls and thus contribute to acceptability (ECMT, 2007)

Regulatory Measures

Regulatory measures refer to administrative measures, policies, regulations or even legislations that directly alter the travelers' behaviors (Hon, 2005). Regulatory measures include; access management, parking control, restrictions on vehicle use, traffic calming and flexible working hours. Regulatory measures have many constraints. First, to the public, these measures, especially the restrictions on automobile use, narrow down individual choices and are too rigid to human freedom. These may not be applicable to every community. Secondly, these measures often adversely affect economic well-beings by altering normal traffic flows (Hon, 2005).

Land use Policies

Transport and land use policies are closely related. Land uses gives rise to trip generation and influence regional trip patterns. So, it is necessary to co-ordinate long term land use and transport planning (ECMT, 2007). To address congestion problem in the long run, land use policies for adjusting that imbalance are necessary. Through planning, land uses should be re-located in such a way that the need and the amount to travel can be minimized. With optimal land use and development policies, the demand for travel can be reduced to the least level (Hon, 2005).

2.5.3 Traffic Management and Environmental Protection

The contribution of transport to air pollution can be viewed broadly as the product of three factors. Air pollution from mobile sources can be decreased by reducing emissions per unit of fuel, consuming less fuel per passenger- or freight-kilometer traveled or requiring fewer passenger- or freight-kilometers. Effective interventions for reducing transport-related emissions range from general improvements in sector efficiency to specific regulatory, policy, and institutional development, and technical measures (ESMAP, 2001). Transport emission reduction strategies target either the transport system as a whole or individual vehicles, and they can affect both at the same time. Changing fuel prices can have an immediate impact on the use of individual vehicles and, over time, affect the overall composition of the vehicle fleet (Ken, Masami, and Todd, 2004).

Many measures taken to reduce transport-related air pollution will be suboptimal or ineffective over the longer term without policy changes in the transport and fuel sectors. While such policy changes will rarely be made based on environmental concerns alone, it is important to recognize that reforms in the urban transport sector or the oil and gas industry can have an enormous positive effect on reducing transport-related air pollution. Some reforms, such as import liberalization for clean fuels, will be national in scope, whereas others, such as urban transport sector reform, will be local. In both cases, they are likely to have significant economic and social benefits aside from their environmental benefits, and in this sense should be seen as “no regret” measures (ESMAP, 2001).

Transport sector emissions can be reduced through a variety of changes to the overall transport system: efficiency improvements in the urban transport system, changes in modal shares through infrastructure investments or land use policy, or through fiscal policies that can affect fuel and vehicle technology choice, fuel consumption, and vehicle use. Traffic system management is intended to smooth the flow of traffic and enhance mobility, but can also have the added benefit of reducing emissions and fuel consumption. Traffic signal control systems are the most common traffic management instruments to secure traffic flow objectives. Segregation of traffic, including bus priority systems (such as dedicated bus lanes), can decrease variability of traffic speed; enhance safety, and, equally important, increase the efficiency and attractiveness of public transport, resulting in significantly lower fuel consumption and emissions. Thus, Traffic management has the potential to achieve reductions in air pollution and to be affordable, even by poor countries (ibid).

2.6 INSTITUTIONAL ARRANGEMENT FOR TRAFFIC MANAGEMENT

Planning, implementation, operation, maintenance and regulation of city transport are a highly complex process encompassing numerous modes, users, agencies and the framework within which

the system functions. Above all, urban transport is a highly political and visible activity. Failure to deliver an acceptable transport system is immediately evident to transport system users – passenger queues, traffic congestion, slow journey times, accidents, poor traffic related environment and so on are immediately evident. Concerns by users of poor quality transport systems are usually high on the list of complaints against a city administration.

Traffic management has become a discipline in its own right and requires an organizational structure to ensure that the best can be obtained from that discipline; a professional "traffic management agency" is needed to develop traffic strategy, initiate, plan and design schemes and policies and so on(John,2000). He also mentions the importance of involving police in this process since the police who will be responsible for the enforcement of traffic regulations on which most schemes depend. While the “traffic management agency” should be responsible for planning, design and operation of all traffic schemes it is an essential part of that process that the traffic police should be consulted and informed at all stages of scheme development.

Thus, efficient traffic management and operations requires a competent, professional agency working within a well-defined institutional structure. Institutional arrangement for traffic management is the key element of a successful traffic management system (Frame, 1999). He also dictates that, the issues require , a range of actions for resolution but key will be the creation and/or strengthening of a city based traffic management agency with well-defined responsibilities and accompanying powers to fulfill the tasks required for effective traffic management; An institutional framework which recognizes and legalizes, the formal role and responsibilities of the “traffic management agency” in relation to the traffic police, to the "highways agencies" and all other agencies with interests in the transport sector; As far as practicable, the traffic management agency should be de-politicized to avoid technical staff and program changes when new mayors or political parties take office (Frame,1999). The institutional arrangement may vary from city-to-city and with the city size and complexity of the traffic but, traffic management is to be successful, there is a need for an agency with the powers to fulfill these functions and for an institutional framework that allows it to exercise the necessary powers (John, 2000).

Ho Seng(2006), in his study of traffic safety improvement in Singapore describes that; traffic management is mainly the responsibility of both Land Transport Authority (LTA) and Traffic Police (TP). While LTA provides road related facilities for road users and ensures the safety of vehicles, TP is responsible for enforcement of traffic regulations, and for publicity and education.

Together with National Safety Council (NSC), TP conduct regular campaigns to promote observance of road safety rules (Ho Seng, 2006).

2.7 FACTORS HINDERING EFFECTIVE TRAFFIC MANAGEMENT PRACTICE

Traffic management is a set of strategic practices utilized by transport authorities to ensure uniform vehicle flow and to avoid delays due to congestion and ultimately to improve safety. Proper management of the transport facilities especially with regard to setting standards for drivers and the state and operation of their vehicles are essential elements of traffic management practices. However, in African perspective, there are various factors which make traffic flow management challenging in almost all cities in Sub-Saharan Africa. Cities today are faced with a number of problems with respect to traffic management, as their expansion has significantly increased transport demand. Municipalities and transport authorities face the challenge of meeting this demand in the most efficient and sustainable way, however the range of solutions that can be applied is constrained by many limitations (Kaparias, Zavitsas, and Bel, 2010).

2.7.1 Road Condition

Road networks are observed in terms of its components of accessibility, connectivity, and traffic density, level of service, compactness, and density of particular roads. Level of service is a measure by which the quality of service on transportation devices or infrastructure is determined, and it is a holistic approach considering several factors regarded as measures of traffic density and congestion rather than overall speed of the journey (Mannering, Walter, and Scott, 2004).

Abiodun (1997), indicates that 'the problem of inaccessibility can be attributed to two factors, one is lack of integration of roads in privately developed layouts, the other factor is lack of coordination among the multiplicity of agencies responsibility for transport facilities that invariably results in sharp breaks in the standard and quality of road development and maintenance. Ibitoye (2005) and cited by Adamu (2009), expressed that the combined effect of poor execution and poor planning of road network project contributes to urban transport problems. Urban roads in developing countries are in dire need of maintenance, pedestrian facilities and traffic segregation measures.

Beside Vipinet.al. (2012) expressed that, the developing country cities road as narrow and poorly built. As cities grow in an ad-hoc manner, no provision is made towards scaling road capacities, eventually resulting into several bottleneck roads, which remain congested for extended periods of time. Furthermore, many developing countries have witnessed an explosive growth in their

vehicular population resulting in a failure of conventional traffic management strategies (Vipinet et al. 2012).

Ogunleye (2005), in his study, reiterated that roads are often in need of maintenance, traffic sign is often inadequate, facilities for pedestrian are poor and guidance to drivers or other control measures are rarely available. The net result of these inadequacies is the very incidence of road casualties and fatalities. Those substandard roads, which surface are narrow, low quality and slope heavy and line shape can mislead to the drivers and pedestrians, which cause the emergence of the traffic accident (Lu, H.P. et al.2003).

2.7.2 Enforcement Measure and Enlightening

Enforcement and traffic laws have to do with government policy regarding road traffic issues. The aim of traffic regulation systems and enforcement is to ensure adequate operations in the traffic environment and system maintenance by legislation and controls. Regulations by traffic signaling systems, speed limits and speed controls as well as the existence of police patrols and checkpoints can lead to some reduction traffic problems by influencing the road user's behavior (Komba, 2006). Jorgensen and Abane, (1999) also argued in their study in Ghana that, traffic regulation schemes are not systematically implemented and the police service is generally less well trained, equipped and motivated to enforce moving violations, as are evident in cities in developed countries.

A regulatory system must be enforceable under specific circumstances for it to benefit the society. This is because poor enforcement of regulations plagues developing countries leading to Unreliable transport service, Poor vehicle maintenance standards which may affect safety and contribute to pollution, Poor driving standards which affect safety result in traffic congestion and maltreatment of passengers, Violence between operators, Anti-social or dangerous on the – road behavior, Unaffordable transport fares (Sumaila,2013).

Traffic enforcement is one of the objectives for putting traffic agencies in place, in order to ensure effective traffic flow. To achieve this, various penalties were put in place, ranging from payment of fines, vehicle impoundment, psychiatric test among others depending on the nature and gravity of the offence. These are made worse by lack of adequate training/testing for drivers, ineffective traffic laws and drivers/pedestrian attitude to driving code, traffic rules and regulation(Durojaiye).

Enlightening the general public and motorists about traffic rules and regulation, traffic safety as well as behavioral attitude of motorists are some of the cardinal tasks of the traffic agencies.

However, the education of traffic safety is not propagable enough and people's awareness of traffic safety is low.

The propaganda of the traffic safety is an important component of traffic safety management, but the citizen isn't concern about traffic safety enough, not observing traffic rules. For example, they break rules and regulations by traversing the street randomly rather than following the crosswalk, making a dash across the red light, carrying flammable and explosive luggage and smoking in the carriage on transit, etc. Those all will cause the traffic accidents. Accidents happens occasionally when driving after drinking, going over the speed limit, driving without a license, not wearing the helmet, rushing in the forbidden zone. In addition, for various reasons, training the driver and issuing license is more confusing in small and middle cities, which causes a lot of drivers with faint safety consciousness and inferior technique, and which is one of the reasons happening in important traffic accident (Vipinet el. 2012).

2.7.3 Capacity and Resource

Good traffic management requires effective planning, implementation and enforcement skill which tend to be in short supply in developing countries. Critical to successful implementation of traffic management measure is the establishment of traffic management unit at the local government level with the consolidated authority and ability to plan and implement suitable traffic management schemes (Akbar, 2002).

The lack of adequately qualified and trained staff in the regulatory agencies is often a major constraint on removing institutional bottlenecks to more effective regulation (Ismail and Venter, 2007). Major issues like policy-making capacity of central agencies, especially through developing skills in planning and economics; information management to strengthen monitoring of the road sector; capacity in developing and implementing road safety programs; driver training and examination standards; vehicle roadworthiness inspection standards; and capacity in drafting regulations which would support policy objectives are the general problem affecting administration of road transport.

City transport authorities are very often confronted by political difficulties, difficulties in communication between organizations, and difficulties in sharing information. Various traffic management policies and technologies have been implemented in many cities, but the effects that these have and the comparison with other techniques implemented elsewhere remains an open question (Kaparias, Zavitsas, and Bel,2010). Traffic management is an inter-disciplinary area that

requires expertise from many fields like engineering, law, social sciences (psychology, humanities, etc.), economics, ethics and management. Thus, a nodal agency with power to enforce traffic laws, traffic planning, design and operation could lead to better traffic management (Panda and Pundir, 2002).

Beside it lacks a universal problem that could prove to be detrimental is funding. Funding is seen as leveraging influence (Ismail and Venter, 2007). A significant amount of investment is required to set up a traffic management infrastructure which can scale with the increasing traffic. Such an infrastructure not only involves measuring and analyzing real-time traffic data but also focuses towards enhancing congestion detection, solving real time congestion and forecasting congestion scenarios. Tighter budget, ravaged by corruption and bureaucracy, there are multiple hurdles before the money actually progresses towards such large initiatives (Vipinet el. 2012). Traffic management is often starved of resources for implementation and operation of schemes. And it might have some potential revenues (parking, traffic fines, congestion charges, concessions for bus ways etc) and other potential funding sources for traffic investment might be available such as urban fuel surcharges and contributions from property/business taxes (John,2000). However, traffic management is to be successful, cities need to capitalize on these revenues and consider earmarking funds to the traffic system (similar to road maintenance funds (ibid).

(Vipin et el. 2012)on their study of congestion problem in developing countries, they point out use of archaic management is a challenge for traffic management agencies. Traffic junctions are often unmanned, thereby allowing drivers to drive in a chaotic manner. Even if a junction is controlled by a cop or a traffic light, the traffic junctions are largely independent of any traffic management strategy, only optimizing the respective junction traffic flow, in the direction of maximum traffic build up. Furthermore, these approaches enhance traffic mismanagement in already congested roads, accelerating congestion collapse.

2.7.4 Drivers

It is expected that all motorists should be knowledgeable about traffic signs. This implies those without the knowledge of traffic signs partly constitute a cause of traffic jam in which further corroborates the poor traffic enforcement response by traffic officials. In addition bad behavioral attitudes of motorist's are major challenges faced by officials (Durojaiye, n.d).

Physiology and psychology of driver include driving behind the wine (medicine) and fatigue driving, not obeying the traffic regulation to give way, going over the speed limit and negligence,

etc, and those phenomena violating the regulations is become the major part of the causes of accidents. The production of these phenomena, on one hand because some drivers lack general knowledge of driving, on the other hand some drivers generally pursue to the fast excessively. Under the influence of such impetuous psychology, in addition, technology is not really up to the mark, so that it is bring the source of traffic accidents that is difficult to keep within limits (Hu Qionghong et.al., 2005).

Moreover, Drivers often are not trained sufficiently to follow lane discipline. The impact of poor lane discipline, especially at traffic junctions, deteriorates the already overcrowded junction situation. Furthermore, drivers frequently jump red lights and block the intersection, causing further traffic congestion. These problems are compounded by the fact that traffic law enforcement is poor, thereby providing no incentive for drivers to follow the rules (Vipinet el. 2012).

2.7.5 Vehicles Condition

Vehicle condition influences the probability of accident to a great extent. A new and well-maintained vehicle has a low probability of accidents. Results of some studies have shown that vehicles above four years of age cause maximum accidents. Such vehicles not only pose a threat to the smooth flow of traffic on highways, but also to the environment through their highly polluting nature. A common policy on this aspect to stop old vehicles on National Highway is very much needed vehicles having defects in the breaks (Haribandhu and RS 2002).

In general, Poor road infrastructure, lack of enlightenment programs, poor behavioral attitude of motorists, lack of inadequate manpower coupled with poor incentives on the part of the traffic agencies and lack of sufficient budget are some of the impediments hindering the activities of traffic management agencies.

2.8 TRAFFIC MANAGEMENT FOR SUSTAINABLE TRANSPORT

Sustainable transportation involves infrastructure investments and travel policies that serve multiple goals of economic development, environmental stewardship and social equity. The objective of which is to maximize the use of the transportation system to achieve economic and related social and environmental goals, without sacrificing the ability of future generations to do so (Oni,2010).

A sustainable urban transport system requires strengthening various features of the system including mobility, accessibility, affordability, social equity, efficiency, safety, security, convenience, low carbon, comfort, and people- and environment-friendliness. In order to achieve all these elements,

various challenges need to be addressed in an integrated manner. These challenges include improving human health through the reduction of urban air pollution, tackling climate change, reducing the number of deaths and injuries from road accidents, controlling excessive motorization, improving public transport services, encouraging more walking and cycling, and recognizing the specific needs of urban poor, women, the elderly, people with disabilities, youth, and children (METRASYS,2012).

Traffic management has the potential to contribute to seamless transport in urban environments. It can also make a contribution to the improvement of air quality in the city center by diverting traffic. Vital, however, to the contribution to a sustainable transport system is the design of the scheme and the wider concept in which it is embedded (METRASYS,2012). Vital to the success of sustainable urban transport concepts is a mix of measures that improve the efficiency of the vehicle fleet, reduce travel distances via integrated land-use planning and provide modal alternatives to the private vehicle (Newman & J. Kenworthy 1999). A reliable and affordable public transport system is a key element of a sustainable urban transport concept. While providing a similar level of mobility, public transport only requires a fraction of energy and space compared to the private car. Public transport not only contributes to lower energy consumption and emissions it also reduces congestion, which improves traffic flows and reduces travel times (OECD & ECMT, 2007). The predictability of travel times with, light rail (LRT) and/or bus rapid transit (BRT) compared to a journey in the private car may provide enough incentive to shift from individual to public transport (Lam, T.C., Small 2001).

In addition to public transport, non-motorized modes, i.e. cycling and walking, can take a substantial share of the urban transport task, in particular on short distances and help reducing emissions and energy consumption and reduce congestion. Walking and cycling is especially suitable for urban transport as in cities the majority of trips are short distance trips (Moudon, A.V., Lee 2003). But, the provision and maintenance of infrastructure for pedestrians and cyclists is crucial to make these modes more attractive.

Traffic management involves the allocation of infrastructure (road space or train slots on a railway network) according to strategic operational and policy goals. These include efficiency, safety, environmental, economic and equity objectives. In real terms, meeting them may encompass measures that include giving priority to buses, trams or other vehicles such as emergency services

or high occupancy vehicles, increasing space available for pedestrians and cyclists, or providing shared road space (Oni, 2010).

Concerns about safety keep many people from cycling (METRASYS, 2012). Separate crossing signals, cycle lanes and buffers between road and lane can improve the safety (Santos u. a. 2010). Integrated land-use planning focuses on higher densities, mixed use and the integration of public transport and non-motorized transport infrastructure (Hymel, K.M., Small, K.A., Dender 2010). Combined, these factors can reduce travel distances, can enhance the role of non-motorized modes and can improve accessibility and efficiency of public transport (METRASYS, 2012). Smart land-use planning only takes effect over longer time scales, but impacts are lasting. In cities that are rapidly growing, local authorities can largely influence future travel patterns. Thereby, land-use planning decisions of today can ease the traffic management task in the future.

Moreover, Introduction of advanced transport systems is another approach to traffic management in reducing the number of motorized trips and making traffic flow more effective. Freight distribution in cities can also be improved. Information on alternative modes and on existing traffic conditions e.g. congestion, can be given as pre-trip information, and current traffic restrictions as on-board information (Oni, 2010).

He also stressed that, the need for sustainable urban development will sharply affect urban transportation in the future. Goals, targets and aspirations will be set to, for example, reduce Co2 pollution which must lead to reduction of transport demand and car dependency. Non-motorized trips and use of energy - efficient vehicles will be promoted. The cities will be changed to be more compact, inclusive, and land use will be more adapted to public transport use. Environmental zones where only pro-environmental vehicles are allowed will be established in central areas and in residential areas (ibid).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter is about the methods that were used for collecting information in the field. This chapter mainly explains how the study was conducted, the applied methods and techniques in data collection and the reasons as to why they were used according to the research aims and main objectives of the study. This chapter involves discussion of the research process, the selection of the study area, sampling methods and justification and sources of data used in the study. Analytical techniques used in analyzing the data for the study are also discussed.

3.2 Selection of the Study Area

Addis Ababa, the capital of Ethiopia is not only the political, social, economic and geographic center of the country but also it is the seat of governments ever since the day of its emergence as a city, 1886. It is the home to African Union, the Economic Commission for Africa, Council of the Oriental Orthodox Churches and many other international organizations. Addis Ababa has an area of 540km² (54000ha) and average elevation of 2500m above mean sea level. It is located almost in the central part of the country.

According to AACG (2010), the population of the city is nearly 3million. The city is a cultural mosaic of all Ethiopian ethnic groups due to its position as capital of the country. The current administration of Addis Ababa constitutes 10 sub-cities, '*KefleKetemas*' and 116 *Woredas*. Addis Ababa contributes a lot to the economic development of the country and it is where most significant changes in the socio- political sphere of the land emanate from. Addis Ababa has been manifesting to be a fast growing city in recent decades and contributes about 40% to the national GDP. However, the growth is accompanied with several constraints as it has not been provided with an equal growth in urban transport provisions is lagged behind the existing demand. Moreover, the sector is expressed by many traffic problems.

Comparative to other cities in the nation, the greater numbers of motor vehicles are found in Addis Ababa with a total share of 56.1 percent of the total motor vehicles in the nation. Thus traffic problem in the city goes up together with the increase of motor vehicles and population size. More over the rise in automobile ownership together with the condition of the roads has resulted in the high level of traffic risk and congestion problems. This calls for the development effective traffic

management within the city. Therefore, this study primarily focuses on the capital city as it believed that it is where the predicament of traffic problems and management challenges are extreme.

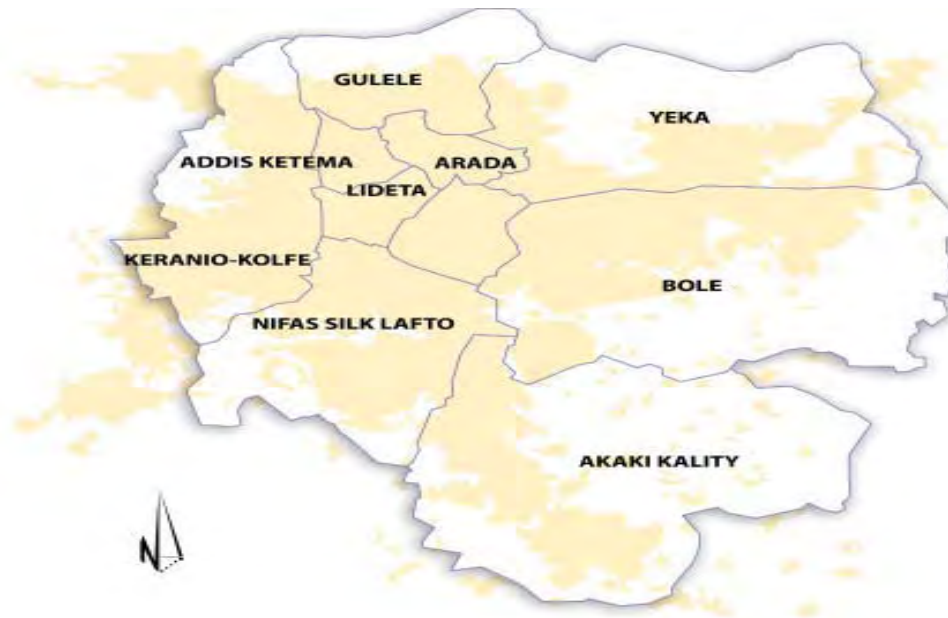


Figure 3.1: Map of Addis Ababa City showing the sub cities

3.3 The Research Process

The methodology and procedure for data collection employed in the field was based on qualitative methodologies. Interviews, questionnaire, observations and review of secondary data, were done accordingly.

3.3.1 Qualitative Methodologies

A qualitative research methodology covers a number of alternative techniques, including interviews, participant observation and focus group discussions. Qualitative methodology helps to understand life experiences and to reflect on the understandings and shared meaning of peoples' everyday social life and realities (Limb 2001).

In this study qualitative approach has been used to collect the primary source of data through interviews with officials from road and transport bureau, official from traffic police office and both private and commercial vehicles operators and through personal observation to seek the views of the respective officials in their respective organization about what has been done about traffic management in the city.

This necessitated the need to interview them using the in-depth method with the help of an interview guide. Field observation was used to see how vehicles respond to the road signs, the functionality of the installed controlling tools and the implementation of enforcement measures.

Qualitative methodology is mostly based on a humanistic view, and humanistic geographers have sought to challenge the mechanistic and objectivity approach that characterizes positivism. According to Limb (2001), researcher and researched should be central to the research process, stressing the need to understand the life world of individuals and the taken for granted dimensions of experiences.

3.4 Data Type and Source

The study employed both primary and the secondary data types. Officials and experts of the Road Transport Bureau of Addis Ababa, commercial vehicle drivers as well as private vehicle drivers, and traffic police were considered as the primary source of information.

While secondary data is collected from reports, published as well as unpublished materials from the City Administration, Traffic Police Office, Addis Ababa Transport Bureau (AATB), and sub functional organ of AARTB which are related in the area of the study. Besides, different books, journals, research papers written on the issues and the internet are also considered for the study.

3.5 Data Gathering Tools

Interview and questionnaires were considered as the major means of data gathering tools. In addition to this, the study used field observation.

Three sets of interviews were administered. The first and second set of the interview were used to elicit information from experts and officials of Addis Ababa Transport Bureau as well as traffic polices unit on the operational activities and challenges facing the units. The third set of interview were used to collect information from the commercial as well as private vehicle drivers as regards Addis Ababa city driving experience and their perception about traffic management unit activities on the city roads.

In addition, semi structured questionnaires were distributed for purposely selected employees of the road and transport bureau based on their qualification and experience in the area of study.

Finally field survey was undertaken by the researcher to assess the condition of the existing traffic situation and management practice employed within the boundary of the city.

3.6 Sampling Method and Respondent

A combination of purposive, systematic random and quota sampling techniques were used to conduct this study. Respondents were selected based on their knowledge in the area of study. With this specific purpose, the sampling started with the selection of an expert in the transport bureau for an interview. Accordingly, three key informants were interviewed. These professionals provided

information to help in identifying the current practices being used as well as their efficiencies and inefficiencies. This information also touched on the ideal traffic management practices related to the city transport sector; and selecting the most efficient, sustainable and traffic management practices for the Addis Ababa city.

Similarly, one key informant from the Addis Ababa Traffic Police Office is purposively selected and an interview was conducted. His responses were taken as representing the opinions of the traffic police officers. The guiding questions aimed at getting information on how policemen collect road accident data, problems encountered in dealing with the city's traffic situation, how rules and regulations are controlled, how motor traffic accidents can be prevented in city and the office coordination with the traffic management office.

Each key informant was interviewed separately on a different day or time following a scheduled appointment, each interview took between 30 to 45 minutes, and it was conducted by using a semi-structured interview guide.

In addition to the key informant interview, twenty five employees were purposely selected from Road and Transport Bureau with respect to the specific job they assigned in relations to the study area.

Correspondingly on road links with high traffic congestion records, two roads were selected based on the magnitude of the traffic problem in the respective area. Since the total number of vehicles plying the two road links understudy, it was difficult to construct a sample frame for the drivers. For this reason the researchers used quota sampling techniques. Based on this, a quota of twenty five (25) drivers of passenger vehicles was allocated to each of the two roads to make a sample size of 50 for the drivers. The quota distribution rate for each road comprised of fifteen (15) taxi drivers and ten (10) private car drivers. The respondents from each category were selected using systematic random sampling based on every third driver met at the terminals.

3.7 Data Analysis

In analyzing the data collected, the following descriptive analytical methods were used. This method of analysis was chosen based on the nature of the research: an evaluation of the existing traffic management practices and respective challenges using ideal management practices of traffic as the benchmark. These methods helped facilitate reporting on and evaluation of the practices within this sector. In order to give a better report on what is being done within the study Area, a

description of the research findings would be the best examination of the actual conditions in the sector; hence the descriptive analysis.

Hence information collected through review of documents and interviews are analyzed within the framework of the study objectives. Data obtained from official records are tabulated in to different categories and analyzed using simple statistical methods such as percentages and graph.. Information obtained from the secondary and primary source are used to make a descriptive analysis of the situation and based on the findings relevant conclusions and recommendations are drawn.

CHAPTER FOUR DATA PRESENTATION AND ANALYSIS

This chapter analyzes and discusses the major finding of data collected through different methods stated under methodology. In this part document analysis, field survey and in-depth interview are mainly incorporated and an attempt is made to give response to the research questions.

4.1 TRAFFIC CONDITION AND ROAD NETWORK IN THE CITY

4.1.1 Road Network

The construction of infrastructure network like road network, roundabout, junctions pedestrian walk ways, traffic signs and road markings, parking spaces and terminals and service provision in a way that facilitate the traffic flow is the main policy issue proclaimed in the transport policy of Addis Ababa.

Accordingly data gathered form city road authority indicates that, from year 1998 up to year 2013, a total of 3,200km road has been constructed in the city main arterial areas and in total Addis Ababa boasts 3731 km of road with seven meter width. Similarly the data indicates that 907km of asphalt and gravel roads are maintained from year 1998 to year 2013.

Table 4.1: new road constructed form year 1998 -2013

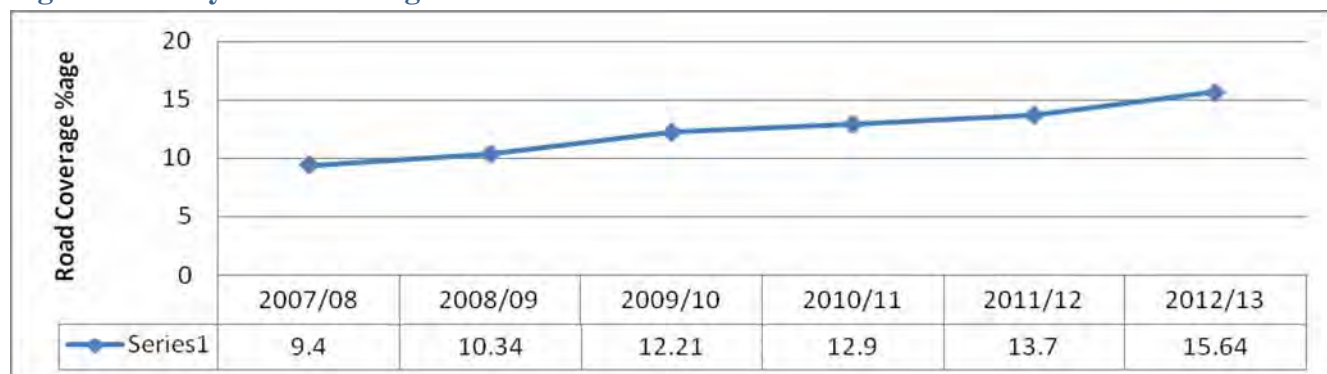
| Type | Measurement | Period in Years | | |
|--------------|-------------|-------------------|---------------------|---------------------|
| | | 1998-2008 | 2009-2013 | Total 1998-2013 |
| Asphalted | Meter | 240,790.00 | 320,844.00 | 561,634.00 |
| Cobble stone | Meter | - | 1,623,284.00 | 1,623,284.00 |
| Graveled | Meter | 557,768.00 | 549,726.00 | 1,107,494.00 |
| Total | | 798,558.00 | 2,493,854.00 | 3,292,412.00 |

Source: Addis Ababa Road Authority 2014

Correspondingly the city road coverage from year 2008 to year 2013 has shown an increasing trend as it is depicted in the figure below. The city road coverage has reached to 15.64% in the year 2013 by showing a 66% increment from the total road coverage of year 2008 i.e 9.4%.

This implies that the government has given much emphasis to road infrastructure and has been constructing and maintaining several roads in the city than ever seen in the past. The A/A ring road, Gotera square, bole road and many other networking roads in different districts of the city are the core examples.

Figure: 4.1 City Road coverage



Source: Addis Ababa Road Authority 2014

As quality of transportation services and infrastructure is determined by the available road network, connectivity and density of particular road. This road development and maintenance has a contribution for efficient and effective transport service in the city. Yet in the process of developing and expanding road networks, problems arise in new construction and especially in rehabilitation schemes since insufficient attention is given to road safety impacts that can be associated with road infrastructure projects. The higher speeds on improved roads lead to an increase in road safety risk for communities along such routes especially for vulnerable road users. This, in turn, leads to an increase in the number of deaths and casualties on such roads and the incidents along some of the improved trunk roads in the city can testify the fact.

4.1.2 PATTERN OF TRAFFIC GROWTH

The Table 4.2 below reveals that the number of vehicles (all types) operating in the city has grown by 100 % within ten years interval (i.e. from year 2002 to 2012) and the annual average growth rate of the motorization is 8.3%. This number is expected to be growing at a rapid pace with the development of the socio-economic activity of the city as large volume of traffic entering/exiting the city area, growing purchasing power of its people and the introduction of low cost private car in the local market.

However currently, as indicated by the officials, considering the available road in the city, the level of motorization is very low. But despite the level of motorization, the magnitude of traffic problems in the city is very high. Thus this demands for proactive planning to maximize the use of the current

infrastructure through effective traffic management and to accommodate the growth of vehicle in the city.

Table 4.2: Number of vehicles operated in the city

| Types of vehicle | Years | | | | | | | | | |
|------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| | 2002/2003 | 2003/2004 | 2004/2005 | 2005/2006 | 2006/2007 | 2007/2008 | 2008/2009 | 2009/2010 | 2010/2011 | 2011/2012 |
| taxi | 8982 | 10113 | 11028 | 12024 | 13279 | 14845 | 15861 | 16979 | 18212 | 18388 |
| Lada | 293 | 315 | 339 | 374 | 428 | 468 | 518 | 609 | 699 | 773 |
| minibus | 7535 | 8331 | 9005 | 9645 | 10721 | 12043 | 13041 | 14018 | 15062 | 15501 |
| Midi bus | 1154 | 1467 | 1684 | 2005 | 2130 | 2334 | 2302 | 2352 | 2451 | 2114 |
| Vehicles | 48191 | 51621 | 54824 | 60281 | 66676 | 60162 | 75502 | 81244 | 86948 | 93968 |
| small veh | 42805 | 45486 | 47896 | 52489 | 58251 | 51213 | 65712 | 70469 | 75209 | 81204 |
| 6-10 seat | 5386 | 6135 | 6928 | 7792 | 8425 | 8949 | 9790 | 10775 | 11739 | 12764 |
| buses(all type) | 1438 | 1688 | 1790 | 1875 | 1995 | 2069 | 2130 | 2221 | 2402 | 2645 |
| Fuel tanker | 1398 | 1562 | 1626 | 1768 | 2135 | 2311 | 2397 | 2566 | 2908 | 3123 |
| Dry cargo | 61838 | 67500 | 72670 | 80039 | 88857 | 95095 | 101730 | 110762 | 120340 | 133283 |
| Total | 121847 | 132484 | 141938 | 155987 | 172942 | 174482 | 197620 | 213772 | 230810 | 251407 |

Source: Addis Ababa Transport Bureau 2014

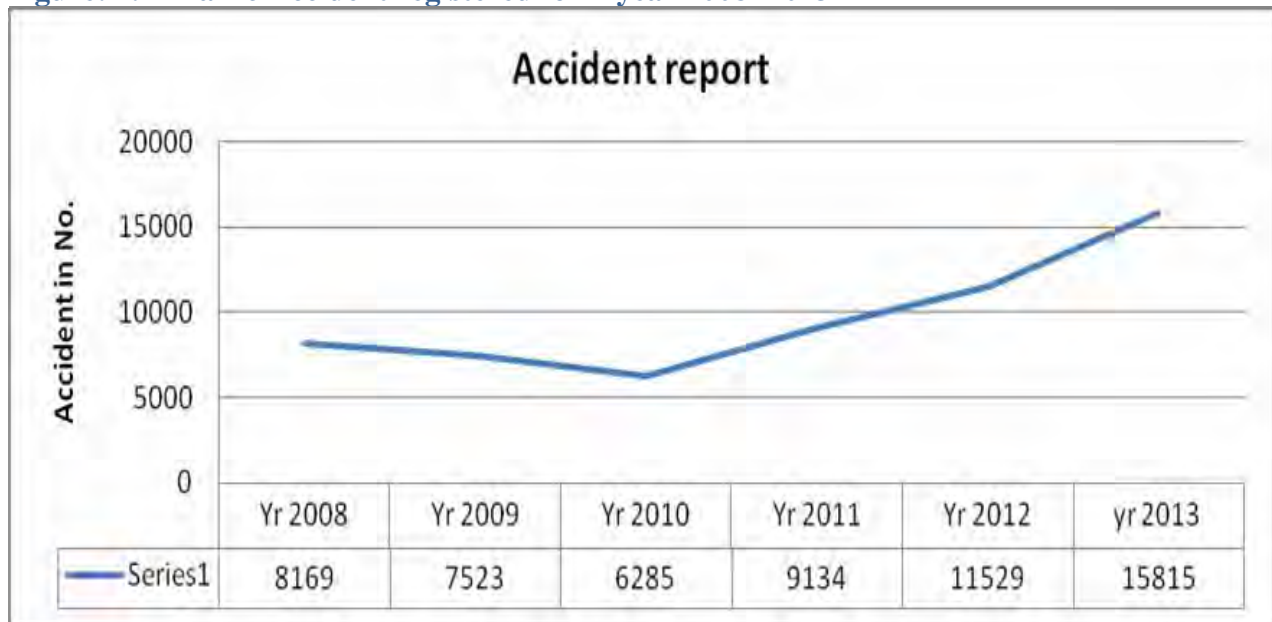
4.2 TRAFFIC PROBLEM IN THE CITY

Transportation is no doubt an indispensable catalyst for activating and stimulating the economic, social, political and strategic development in any society. Thus, effective and efficient functioning of cities depends on the provision of basic infrastructures one of the most important being transport. This implies that transport should to be rationally managed to ensure that movement of people and goods takes place speedily, economically, safely, comfortably and in an environmentally-friendly manner. But the development of the transportation create its own transportation challenges .Thus, in line with the development of transportation in the city of Addis Ababa the city faces major traffic problems. Hence basing the respondent and key informant information this study found that traffic accident, congestion, parking and inadequate public transport provision are among the major traffic problems observed in the city.

4.2.1 TRAFFIC ACCIDENT

Data collected from Addis Ababa city police office indicates that the accident situation has increased at an alarming rate during the last six years. As indicated in the Figure 4.3 below the accident rate has increased by 94% from year 2008 to year 2013.

Figure: 4.2 Traffic Accident registered form year 2008 -2013



Source: Addis Ababa Police Statistic office 2014

The trend also shows the accidents have increased at an increasing rate for the last three recent years. This indicates that, road traffic accidents have remained one of the most threatening challenges of the city and it is daily news that car accident is the most prominent and atrocious incidents happening at every corner of the city. The continued steep increase in the number of crashes and fatalities indicates that these losses are undoubtedly inhibiting the economic and social development of the city and adding to the poverty and hardships of the community at large.

4.2.2 CAUSES OF TRAFFIC ACCIDENT

Data collected from traffic police office indicates that human factors such as ignoring traffic rules, aggressive, reckless and inconsiderate behavior of drivers are major contributors to accidents. The table below reveals that 42% of road accidents occur due to failure of drivers to give way for other road users. Similarly driving without respecting the right hand rules and improper overtaking stopping and turning have contributed for 34% and 12% accidents occurred in the city respectively for the period under consideration. The other serious and regular offences identified by the traffic police are, poor physical conditions of road and vehicles, fatigue and unsafe practices by the drivers.

Table 4.3: Major Causes of Traffic Accident in the city

| Ser no. | Causes of Accident | No. accident occurs |
|---------|---|---------------------|
| 1 | Driving under the influence of alcohol or chaat | 45 |
| 2 | Over speeding | 499 |
| 3 | Driving without respecting the right hand rules | 5,336 |
| 4 | Failure to give way for other road users | 6,645 |
| 5 | Improper overtaking, turning and stopping | 1,947 |
| 6 | Failure to respect traffic signs | 258 |
| 7 | Excess loading | 67 |
| 8 | Poor Condition of road and vehicle | 100 |
| 9 | Poor physical condition of drivers like fatigue | 21 |
| 10 | Reason not identified | 897 |
| Total | | 15,815 |

Source: Source: Addis Ababa Police Statistic office 2014

In addition to the above stated factors for accidents occurred in the city, the respondents indicate that over speeding, unsafe behavior of pedestrians, inadequate pedestrian walk way, inadequate enforcement of traffic regulation and inadequate capacity to control roadworthiness of vehicles are the main contributors of traffic accident in the city.

Figure 4.3: Major causes of Traffic Accident in Addis Ababa

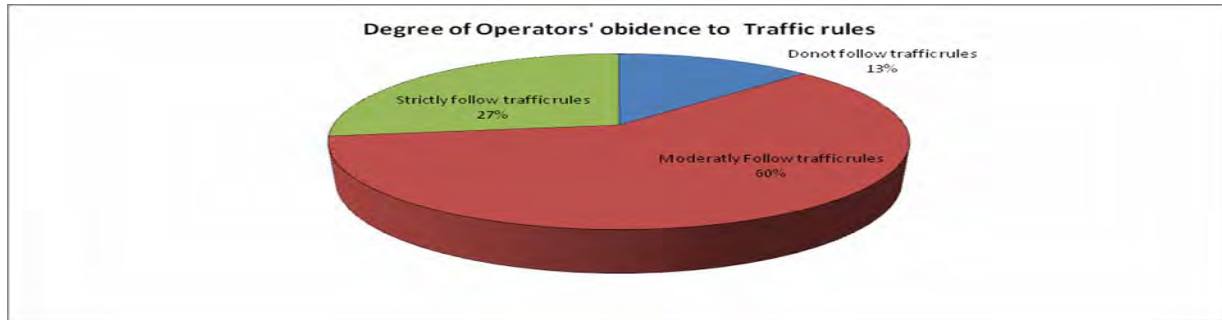


Source: Survey data 2014

Data collected from field survey conducted on private and commercial drivers in the city reveals that the poor condition of the road, lack of parking space, concentration of economic activities and services in certain areas, inadequate traffic facilities such as traffic lights, signs, crossing marks are the major causes identified for the occurrence of traffic accidents in the city.

Moreover as they were asked about their awareness of traffic rules and their obedience for the right hand rules. 80% of vehicles operators indicate they have a good knowledge of traffic rules but among them only 27% say they strictly follow the traffic rules.60% agree they follow traffic rules moderately and 13% never follow traffic rule and this is very alarming.

Figure: 4.4 Application of traffic rules by operators



Source: Survey data 2014

Operation on Addis Ababa city roads are governed by and enforced in accordance with the road transport traffic control council of ministers regulation no.208/2011. As stated by a higher official of transport bureau enforcement is one of the big problems the city is facing with the taxis and motorists alike display a flagrant disregard for simple traffic laws. They also made the very important statement that a crash is preceded by some form of traffic violation in almost every case.

This calls for a comprehensive enforcement and clear legislation with appropriate penalties that accompanied by public awareness campaigns as a critical factor to reduce road traffic injuries and deaths. Yet enforcement on the existing laws of road safety needs to be both improved and sustained. The situation requires close collaboration between relevant leaders and government units whose policies directly or indirectly impact on the safety of those on the road in order to halt and reverse the current trend of increasing traffic death by recognizing road traffic injuries as an important health and development problem and by intensifying support for prevention.

4.2.3 CONGESTION

The data collected from Addis Ababa transport bureau indicate that there are various arterial road and roundabouts identified as major congested areas in all the ten sub-city under the city's administration (see table 4.4 below). And as indicated in the report there are 55 major congested areas in all the ten sub-city and 36% of the identified congested areas and roundabouts have no identified alternative routes to be used as an alternative solution to the problem.

Table: 4.4 number of Congested area in the city and causes of congestion

| Ser. No | Sub City | Congested area and roundabout in number | Cause for congestion |
|----------------------|---------------|---|--|
| 1 | Akakikality | 3 | Too narrow roads |
| 2 | NifasilkLafto | 7 | Too narrow roads, road side parking |
| 3 | Yeka | 3 | Unavailability of alternative roads, road side parking |
| 4 | Kolfekeranyo | 3 | Unavailability of alternative roads |
| 5 | Lideta | 4 | Road expansion and development work, unavailability of alternative road |
| 6 | Kirkos | 8 | Operators not using the available alternative roads |
| 7 | Gullele | 12 | Poor road condition, unavailability of traffic signs, increased number of bus stations, too narrow road, unavailability of sufficient pedestrian walkway |
| 8 | Addis Ketema | 3 | Too narrow road and roundabout, road side parking |
| 9 | Arada | 8 | Road side parking |
| 10 | Bole | 4 | Entering and exiting of heavy trucks in the area, too narrow road , tax terminals with too many vehicles at a time |
| Total congested Area | | 55 | |

Source: Addis Ababa Transport Bureau 2014

The survey conducted also revealed that 68% of the respondents often experience traffic congestion daily, 20% of them experience traffic congestion at interval of 2-3 days per week while 12% experience congestion once a week. This is an indication of a high degree of traffic congestion in selected areas of the city (from Kolfe18 to Autobis Tera and Aratkilllo to piazza and Merkato).

Table: 4.5 Traffic congestion occurrences in the selected area

| | Frequency | Percentage |
|-------------------|-----------|------------|
| Everyday | 34 | 68% |
| 2-3days in a Week | 10 | 20% |
| Once a Week | 6 | 12% |
| Total | 50 | 100% |

Source: Survey data 2014

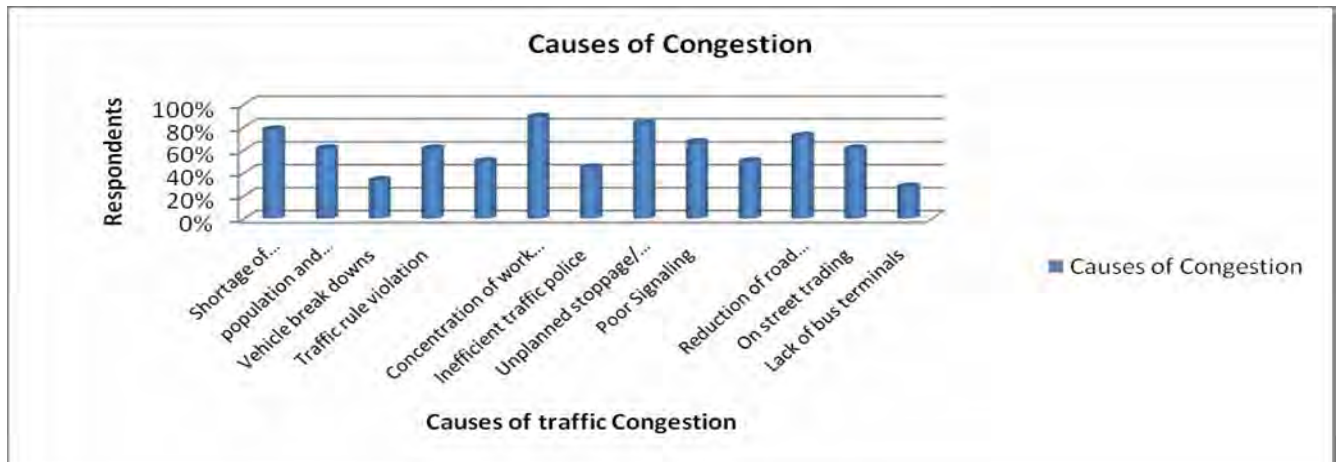
4.2.4 CAUSES OF TRAFFIC CONGESTION

As indicated in the table 4.5 below, too narrow roads, poor road condition, unavailability of traffic signals, pedestrian walkway and alternative road, increased number of bus stations to be among the major causes of congestion identified by Addis Ababa transport bureau.

On the other hand among various causes of traffic congestion in the city, 89% of the respondents indicate that concentration of work trip in time and 83% of the respondents put unplanned stoppage

and parking of cars on the road side as major causes of traffic congestion in Addis. Correspondingly more than 50% of the respondents have put shortage of infrastructure supply, too narrow roads, reduction of road space due to road construction and maintenance, street trading, traffic rule violation, population and economic growth as major contributors to the occurrence of traffic congestion.

Figure 4.5: Major cause of Traffic Congestion in the city



Source: Survey data 2014

Congestion in the city is the impact of poor lane discipline by drivers, especially at traffic junctions which deteriorates the already overcrowded junction situation. Furthermore, frequently jump red lights and block the intersection, causing further traffic congestion. These problems are compounded by poor enforcement practice by the responsible officials are the main causes of traffic congestion identified by key informants at the transport bureau.

Similarly from the operators' point of view, the main cause of congestion the city road is traffic rule violation, too many vehicles on the road than the road can bear, inefficiency of traffic police, and reckless public bus operators are the major causes. But there are some other things that vehicle operators think are responsible for traffic jam in the city like parking problem, poor signaling, and trucks operating at rush hour of the day.

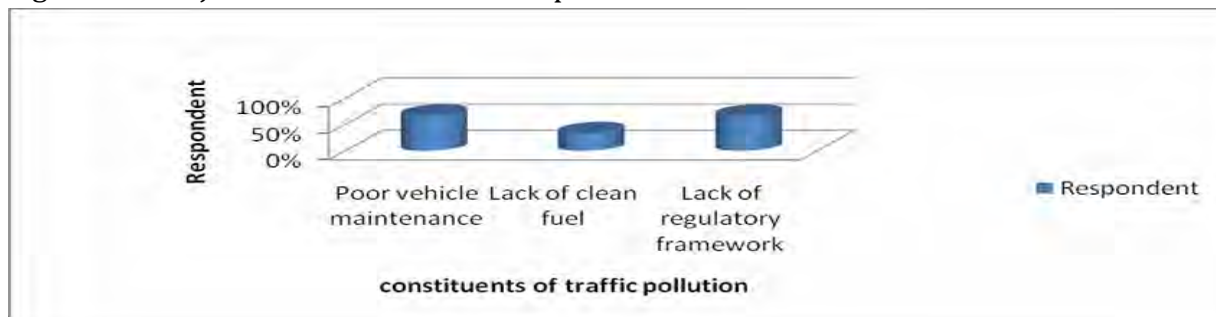
The road sides are also characterized by poor drainage and sewerage system and a lot of pits on the road that are dug by different institutions for different purposes are the ever living obstacles that make the traffic flow sluggish.

4.2.5 ENVIRONMENTAL PROBLEM

Traffic is the main cause of air pollution in urban area. Thus, the main causes of traffic pollution among others are use of old vehicles and poor maintenance, lack of regulatory framework to control

the use of old vehicles and lack of clean fuel for consumption of the vehicles in the city are identified as the major contributors of traffic pollution in the city which is ascertained by almost 67% of the respondents under consideration.

Figure 4.6: Major constituents of Traffic pollution



Source: Survey data 2014

Table 4.6: Vehicles with more than 15 years of operating life

| Types of vehicle | 2011/2012 | | |
|------------------------|----------------|-----------------------|------------|
| | >15 Years | Total No. of Vehicles | Percentage |
| Taxi | 11,943 | 18,388 | 65% |
| Lada | 379 | 773 | 49% |
| minibus | 10,764 | 15,501 | 69% |
| Midi bus | 800 | 2114 | 38% |
| Vehicles | 61,552 | 93,968 | 66% |
| small veh | 57,474 | 81,204 | 71% |
| 6-10 seat | 4,078 | 12,764 | 32% |
| Buses(all type) | 1,647 | 2,645 | 62% |
| Fuel tanker | 871 | 3,123 | 28% |
| Dry cargo | 60,250 | 133,283 | 45% |
| Total | 136,263 | 251,407 | 54% |

Source: Addis Ababa Transport bureau 2013

Table 4. 6 above reveals that 54% of vehicles operated in the city have more than fifteen years of life time with a smoky trail of pollution leaving from their tail pipe. city though old and low capacity vehicles could not and would not solve the problem of transport for better even with the upgrading and expansion of the road infrastructure, it rather creates further congestion, bad traffic accidents and environmental pollution. However the city has no Act that prohibits importing old car to the city.

Due to the high import taxes on new vehicle, most resident of the city could not afford to buy a new or below five years used vehicle. It seems that the government is giving less attention to the fact that how old vehicles are damaging the environment and how much foreign currency goes to import

spare parts. Responses from officials from the transport bureau also supports this fact that there has been no attempt made to control vehicular pollution in the city so far and it can be argued that nothing has been done in this aspect of transport in the city.

4.2.6 PARKING PROBLEM

Parking today is a major challenge in the city. Though on – street parking facilities are provided on many routes in Addis, but increased car ownership has rendered them grossly inadequate. The parking problem is more acute on major arterials which provide access to centers of activities in the city. As indicated by official in the transport bureau, the expectation is that government offices, public buildings, hospitals, schools, shopping centers among others should provide within their premises either on, above, and below the ground parking facilities. But callers to such premises are usually denied parking thereby compelling them to park on the roads and made to pay for short-term durations. Unfortunately, off – street parking facilities are generally absent in most parts of the city. Thus, parking has today become a major obstruction to smooth flow of traffic in the entire capital territory.

As the respondents drivers express the magnitude of parking problem in the city, 80 % of the commercial car drivers state that they are forced to stop and unload the passengers in the middle of the road due to lack of on-street parking or terminals sufficient to bear the volume of traffic operated in the area.

In general, the city vehicular traffic problems are many fold and their causes also vary depending on the nature of the problem. But considering the number of accidents, congestion, parking and pollution in the city and their causes, traffic problem of the city is mainly caused by poor and inefficient road management especially poor implementation of traffic inspection and enforcement mechanisms. This situation calls for an effective traffic management which can cope up with the available road network and volume of traffic operated in the city with all required capability, techniques and tools.

4.3 TRAFFIC MANAGEMENT PRACTICES IN ADDIS ABABA CITY

Though, traffic management is an essential element of good city governance, traffic management policy and measures were not given due attention by city administration. In spite of the fact that an increase in the levels of car ownership, development of the road network and the severity and nature of traffic problems faced within a city the city traffic management was being deserted for the last several years.

Even if there is no single, full-fledged/consolidated traffic management policy, considering the essentiality of improved traffic conditions in the city as a general direction sound transport policy that raise and depict some important elements of cities traffic management is formulated in the year 2011 with a strategy– to make the most productive use of existing roads, traffic systems and public transport by improving operational efficiency and quality, to reduce the social and economic drain arising from accidents by improving the safety and security of the road based transport system and to reduce vehicle emissions and other adverse impacts.

The major aim of traffic management as stated in the transport policy is to ensure traffic management system that enable to provide efficient traffic flow, safe and comfortable transport service in the city; to mitigate congestion and traffic accident in the city; to benefit from the city transport infrastructure and services in its proper and coordinated way in economic manner; and to ensure pollution free transport system and to enable the users and implementing agencies to follow and enforce currently required traffic flow system. Moreover, traffic management is formulated to drastically reduce the loss of life and property caused by road traffic accident.

4.3.1 Main Policy Issue and Strategies

Many of the traffic congestions and road safety problems in Addis Ababa attributed to inefficient use of road networks, weak enforcement capability and poor design of roads. More over poor traffic management with uncoordinated activity, scattered structure implementing agency, low level awareness of user etc are the main rationales for the formulation of the policy. Thus the main policy issue relation to traffic management employed in the transport policy of the city includes:

- The construction of infrastructure network like road network, roundabout , junctions pedestrian walk ways, traffic signs and road markings, parking spaces and terminals and service provision in a way that facilitate the traffic flow
- Take an awareness creation measure to the urban transport users so as to enable them to use the transport network, system and traffic laws properly and respectfully.
- Establish a traffic operation center in order to direct the traffic management with modern knowledge and technology support.
- Coordinate an office responsible for administer and control the transport system in the principle of accountability and efficiency;
- Provide fast, reliable and accessible transport service by concentration on mass transport priority and using the necessary technology.

- Provide immediate and coordinated response to traffic accident;
- Practice off road parking services by discouraging road parking and opening main road for traffic;
- Guide traffic safety strategy based on long term vision and detailed program and take measure to coordinate sector effort.
- Upgrade and ensure traffic safety, accident reduction, drivers' professional ethics and vehicles technical fitness.
- Establish traffic safety council at different level involving stakeholders and city residents in order to coordinate and enhance participation in minimizing traffic accident;
- Employ efficient urban logistic services

Thus, basing the policy formulated with relation to traffic management system in the city, the policy document establishes strategies to:

- Ensure proper functioning of traffic signals, signs, road markings, roundabout and junctions that facilitates to smoothen the traffic flow ,ensure periodic maintenance and avoid the traffic signals;
- Follow up that parking areas do not affect the traffic flow; design and implement parking lots or parking buildings by identifying high traffic locations;
- Supervise that terminals loading and unloading places are properly constructed and functioning, avoid the uncomfortable ones, facilitate to construct the new ones and implement it;
- Perform continuous awareness creation works to the users about traffic education in residential areas, health centers, work places, recreational places, worship places; provide formal and informal traffic education in schools; create conducive environment to governmental nongovernmental institutions and the private sector to work in coordination and cooperation so as to implement such activity as effective as possible
- Ensure healthy, fast and cost effective transport services and traffic management, responsible offices and their staffs shall get continuous training to enforce traffic laws, perform supervision and control; assign organized manpower in quantity and quality that can cover the responsibility of the offices and acquaint introduce them with modern technology;
- Reduce congestion, introduce variable/staggered working hours in schools and offices;
- Enforce mobility of heavy duty freight vehicles and machineries in limited time and space;

- Introduce towing track services to avoid traffic flow affecting vehicles created due to road accident, or damage or illegal parking, encourage the private sector to participate in the business
- Introduce a system and build enforcement capacity to collect current information on traffic accidents; and avoid such incidents that would cause other traffic congestion;
- Coordinate participation of stakeholders to ensure that religious , public holidays and other events do not affect the traffic flow;
- Establish traffic operation center to realize close follow up of the traffic system through the support of modern knowledge and technology;
- Based on study prohibit vehicles not to pass through main trade and market centers; facilitate special treatment, as the case may be, for high occupancy vehicles (vehicles more than 5 seats capacity);
- Improve the traffic flow through introducing traffic congestion pricing, pollution tax, priority for mass transport, prohibiting street vending and animal movement on the road;
- Implement one-way street, as the case may be, that may facilitate traffic flow and reduce traffic accident; and
- Ensure that non-motorized two wheel vehicles are giving service without affecting the traffic flow, street cleaning and road side plant watering services shall be provided not during pick hours.

Indeed following the issuance of city transport policy in the year 2011, the traffic management bureau is established at the process level to implement specific traffic management related policy and measure as it is dictated in the transport policy.

However, the office is not autonomous; its activities are mostly overshadowed by the road authority as it is not organized with the sufficient material, power and competent and skilled human power. Therefore we can say that the traffic management practice of city is at ‘rudimentary’ stage which is undeveloped institutionally regardless of the magnitude of the problem observed in the city. However, with all its limitations the existing traffic problem situation is not without remedy. Since its establishment the office has made efforts to curb the city traffic problem in collaboration with road authority and traffic police office with the aim to improve and manage the transport facilities and improving traffic system capacity, quality and safety.

Thus, considering the stated strategic objectives, the study identifies the following major traffic management activities as experienced by the related office of the government to curb the existing traffic problems. These are known as three E's i.e. Engineering, Enlightenment and Enforcement.

4.3.2 ENGINEERING

Traffic management usually employs traffic control measures to direct a smooth flow of traffic in the road network. Data gathered from the road authority indicates that corresponding to the road construction and maintenance activities carried out in the city for the period from 2005 to 2013, some traffic management tools installation and maintenance work has also been done by the road authority.

Signing

There are three classifications of road signs in Ethiopia based on Vienna convention on road signs and signals. These are regulatory which give notice, requirement or restriction; warning signs which gives warning of a hazard ahead and information signs that gives information to users about the route and about places and facilities of particular value or interest.

Table 4.7: Maintained and Erect Traffic Signs per year in km

| Year | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|--------------------|-------|-------|------|------|------|------|-------|------|------|
| Plan | 900 | 900 | 800 | 600 | 600 | 338 | 660 | 726 | 726 |
| Performance | 610 | 570 | 725 | 615 | 738 | 366 | 434 | 960 | 1416 |
| Variation% | (32%) | (37%) | (9%) | 3% | 23% | 8% | (34%) | 32% | 95% |

Source: Addis Ababa Road Authority bulletin march, 2014

Accordingly on average 715 traffic signs are maintained and erect per year in the city from year 2005 to 2013 for effective control and guiding function. But as indicated in the table above the activity was under performance in most of the period under consideration especially in the earlier period. A recent year performance however reveals that much attention has been given for maintaining and erecting of traffic signs as the performance exceed 95% of the planed work for the period. .

Road Marking

Road markings are integral parts of the road system. They convey important information to drivers on the directions and the driving rules.

Table4.8: Traffic line marking per year in km

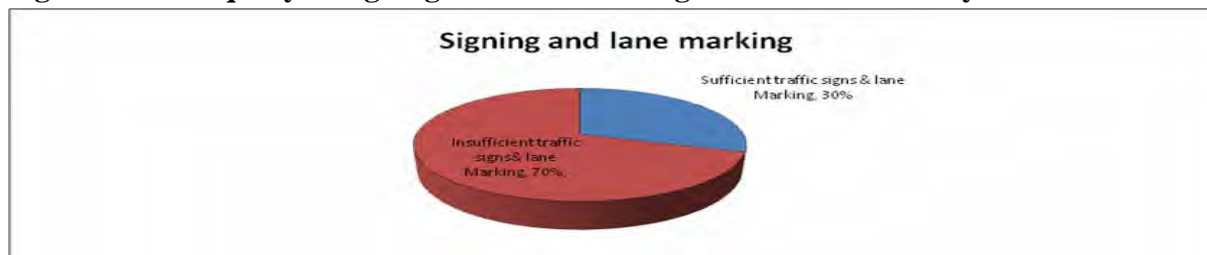
| Year | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|--------------------|------|------|-------|-------|-------|-------|-------|------|-------|
| Plan | 185 | 30 | 215 | 182.5 | 250 | 103 | 124 | 300 | 300 |
| Performance | 221 | 52.8 | 291.5 | 203.6 | 404.4 | 153.9 | 239.1 | 348 | 279.6 |
| Variation % | 19% | 76% | 36% | 12% | 62% | 49% | 93% | 16% | (7%) |

Source: Addis Ababa Road Authority bulletin march, 2014

The above table reveals that the lane marking work undertaken for the period from 2005 to 2013. The finding indicates that the work in this aspect of engineering measure has been performed better than it was planned in all of the period under considered except in year 2013 which is performed below the plan.

However, 70% of the respondents indicate as there is no sufficient traffic signing and lane marking in the city with respect to the level of road constructed in the city. While 30% of the respondents witness the sufficiency of the available signing and lane marking to control the city traffic.(see Figure 4.8)

Figure 4.7: Adequacy of signing and lane marking in Addis Ababa City



Source: Survey data 2014

Traffic lights

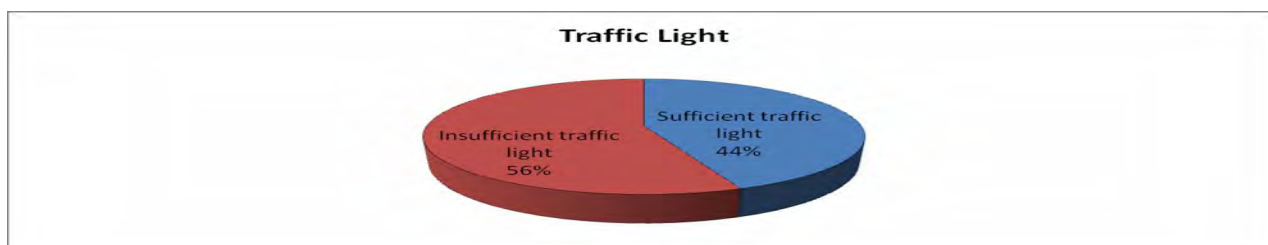
Table 4.9: Maintained and installed Traffic Light per year in Number

| Year | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|--------------------|------|------|-------|-------|------|------|------|------|-------|
| Plan | 16 | 13 | 14 | 20 | 20 | 14 | 13 | 13 | 13 |
| Performance | 15 | 15 | 10 | 18 | 76 | 15 | 17 | 14 | 7 |
| Variation% | (6%) | 15% | (29%) | (10%) | 280% | 7% | 31% | 8% | (46%) |

Source: Addis Ababa Road Authority bulletin march, 2014

The above table indicates that the performances of the city on maintaining and installing traffic light along the city road. A good performance in this aspect of engineering measure is registered in the year 2009 while 76 traffic lights were maintained and installed city wide by exceeding the plan by about 280%. However the performance in the recent years is deteriorated and registered a performance as lower as 46% from the plan for the year.

Figure 4.8: Adequacy of traffic light in Addis Ababa City



Source: survey data 2014

Similarly, 56% of the respondents said that there is no sufficient traffic light installed in the city while 44% dictates there are sufficient lights available in the city road for the smooth flow of traffic in the city.

Official in the transport bureau also states that the traffic lights already erected in the city are either manually operated or operated through a computer chip. The automatic ones were supplied by Siemens AG, the German electrical manufacture, while the remaining came from Dan Techno craft 10 years ago. The lights' being outdated has made the location of spare parts to maintain damaged ones difficult, according to the authority. As a result, hardly any of the lights work, creating traffic jams in the city, especially during peak hours. The lack of functional traffic lights is also characterized as one of the major contributors to accidents in the capital by the Addis Ababa Traffic Police Office.

As a result most of the time traffic police are assigned at the intersections to handle the flow of traffic. As it is described by traffic police official working at a full day at the intersection to regulate the traffic flow whilst it is supposed be supported by the technology is in appropriate and become cumbersome for the officials. As it is stated by the official in traffic police office the poor management of the traffic makes traffic police in Addis Ababa busy all day.

Field observation in various parts of the city also revealed that very few traffic management measures exist, and are not always well maintained. Traffic signs and road markings are inadequate, not visible or non-existent, which receive little attention. Hence signal timings are rarely altered (with changing traffic patterns), and many signals are now inoperative. There are 30 junctions in Addis Ababa and many of the intersections are not provided with traffic light even if they are installed as they are programmed for a fixed time and do not consider which line is more congested and which line should be realized.

4.3.3 ENLIGHTENMENT PROGRAM

Enlightening the public about the traffic rule and regulation including program for drivers training and testing, education and publicity programs are the basic things in traffic management activity. The target respondents were requested to give their consents about the overall enlightenment activities undertaken by the bureau so far. 31% of the respondents indicate that nothing has been done so far considering the magnitude of the traffic problem. However 61% of respondents informed about measures taken so far in terms of educating the public as well as operators (drivers) to curb the traffic related problems in the city. Thus ,the respondents pinpoint that different awareness creation programs have been set to inform the users about the existing traffic problems,

the required safety rules, traffic techniques and their application by using electronic and printed media, by organizing traffic safety club and involving students involve in the safety educational programs, providing traffic safety education in schools, working and residential areas .

However, as the respondents were asked about the adequacy and effectiveness of the program, 80% of them said that activities performed in terms of educating the public at large about traffic related problems and their solutions are very minimal in proportion to the magnitude of the problem. 31% of the respondents suggested that:

- The awareness creation program should be strengthened by widening the scope in terms of area coverage and communication tools.
- Special training program should be arranged basis for drivers at all level,
- The road traffic safety programs program should be included as a full-fledged educational program at the university level in order to create skilled manpower in the area,
- Road traffic safety program should be included at the national educational curriculum so as to change the attitude of the public about the seriousness of the problem.

The study finding indicates that traffic accident is mainly causes by the poor awareness level and attitude of the public at large. These include the low level of road users training and competence, drivers and pedestrians behavior and knowledge on road safety. This in general implies that the level of public enlighten program is not to the level of requirement with respect to the magnitude of the problem. It is very good that several radio and television programs are being transmitted to create awareness about traffic accidents both for drivers and pedestrian. Changing people's attitude is not an easy task, therefore, such awareness creations programs should be more extensive and diversified so that it would be possible to reach everyone in a different approach.

4.3.4 ENFORCEMENT

Policy, regulatory and enforcement actions are necessary and success depends on these as much as physical measures. The new “Road Traffic Safety Regulations of the Addis Ababa City Government No 27/2009” is becoming effective at the end of 2009 (December 2009). After restating the previous rules, the new law brought forward novel rules aiming at the reduction of road accidents, which are threatening the good names of Addis.

The issuance of the Regulations has many rationales. As the preamble states, "loss of life, property, and economy of the city due to traffic accidents has reached critical level" and the emergence of new technology, the appearance of new traffic offences, and the "level of development and modern traffic system" were all recognized as rationales for the issuance of the Regulations.

Although the Regulations, are principally directed towards drivers (e.g. prohibition of use of mobile phones while driving), some of them aim at controlling movements and actions of pedestrians (e.g. crossing a road where it is not permitted), contractors (e.g. blocking pedestrians' road), vagrants (for example, those who might tamper with traffic signs), etc. Depending on their gravity, seven categories of offences were identified (calling for fees ranging between 60 and 700). In addition to fines, temporary suspension (e.g. 3 months) and revocation / cancellation of a driving license (for recidivism) are also other forms of penalties. However the issuance of new rules is not (and should not be) all their implementation has to be ensured.

Enforcement of traffic regulations is exercised by Police and RTO staff. Fear of fine, vehicle detention and cancellation of driving license force the drivers to strictly follow the traffic rules and regulation. However, lack of essential instruments and coordination and due to corruption in the concerned organizations, road users hardly hesitate to flout the rules.

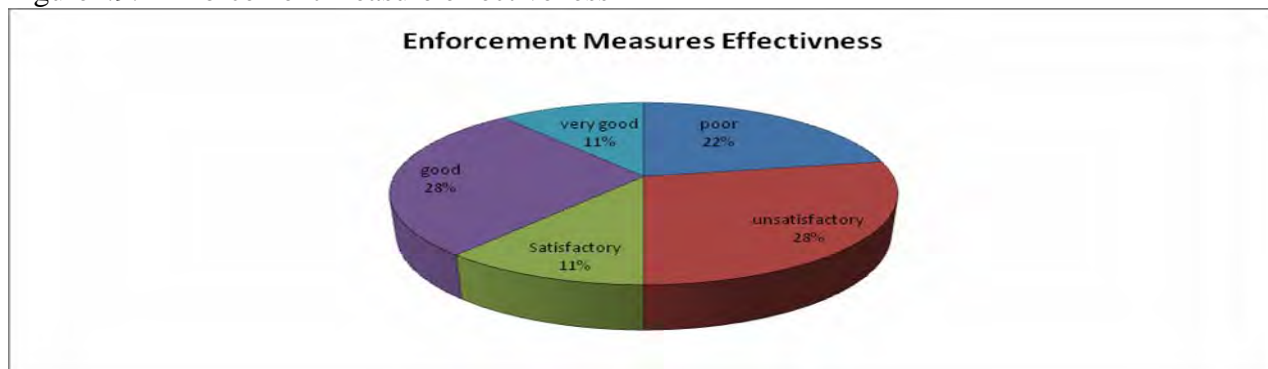
Similarly, some of the respondents indicate that there is an initiation for the strengthening the enforcement activities in collaboration with city traffic police by employing "mobile enforcement", a team base enforcement technique implemented to support the existing activity. However, majority of the respondents also indicate that though different enforcement mechanism has been set by the government, it is only put in the paper as no action has been taken thus far to implement most of the enforcement measures. As some of them indicate there is no sufficient and qualified man power to undertake the activities.

In their opinion, the police rather seemed to be interested in extorting money from motorists who commit traffic offences and letting them go unpunished. From their descriptions, drivers, especially the younger ones, perceived a conflict of interest situation and seemed incensed by the practice of police officers also owning and operating commercial minibuses. According to them this situation does not only lead to selective justice on the part of the police but also undermine the fight against unsafe road use behaviors.

4.3.4.1 Traffic Enforcement Measures Effectiveness on Curbing Traffic Problem

The respondents were asked to weight the enforcement measure employed in the city to curb the traffic problems. While 11%, 28% and 11% of the respondents confirmed the effectiveness of enforcement measure undertaken those far by weighing the extent as very good, good and satisfactory respectively, 28% and 22% of the respondent put some reservation for the effectiveness of the employed enforcement measure by responding the measures to be poor and unsatisfactory respectively.

Figure4.9: Enforcement measure effectiveness



Source: Survey data 2014

As per the key informants at the transport office “the problems are compounded by the fact that traffic law enforcement is poor, thereby providing no incentive for drivers to follow the rules. Most drivers prepare for such fines setting funds aside at the start of daily operations to sort out encounters with enforcement officials. This makes such enforcement efforts less effective. Part of the problem is that the fines are considered meager and easily affordable by Drivers.”

The respondents also indicate that though enforcement measure has a vital contribution on curbing traffic problem in the city, in the city under study context, the measures are not adequately and properly implemented, there is so many inconsistency on the practice and it is not given much emphasis on the matter specially on the implementation of the non-financial matters as it requires resource allocation for the purpose. Most of the time the enforcement measures are expressed in terms of fines but this types of penalty might not result in the expected output rather the measures shall encompass some educational program is among the specified issues pinpoint by the respondent.

This implies that because of weak enforcement implementation mechanism by the responsible organ the traffic problem has worsened irrespective of different regulatory controlling measures are proclaimed by the government. In the city financial penalties have become very popular

enforcement mechanism. But the major problem is financial penalties are often inadequate and need for regularly adjustment. Moreover the regulatory and controls measures need the appreciation and understanding of people in order to get their acceptance. This implies that adverts, campaigns and consultation must be carried out to ensure that people accept the law and appreciate its social benefit as being the general good for all.

4.3.5 VEHICLES' ROAD WORTHINESS INSPECTION

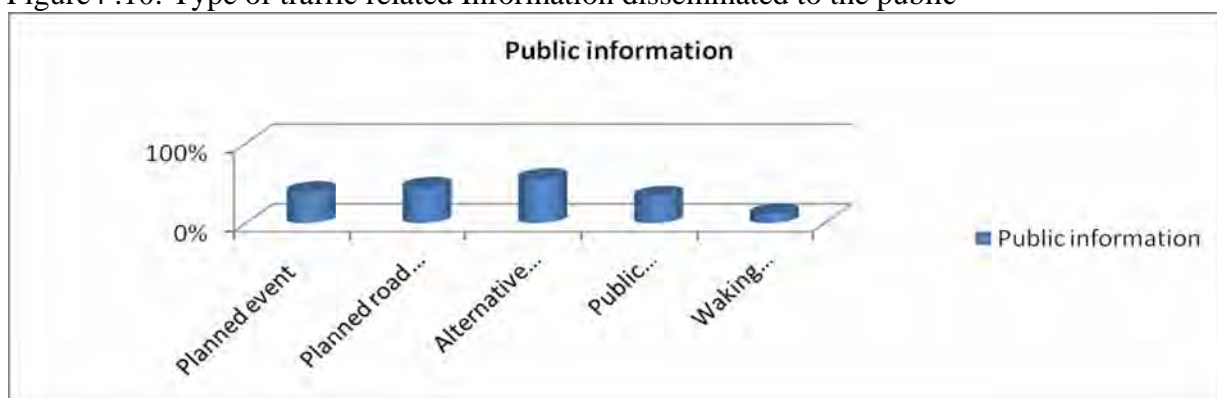
Vehicles shall be inspected for their road worthiness to minimize the risk of accidents, to protect road from congestion occurs due to vehicles breakdown and to have air clear of polluted substances. Thus the respondents were asked to give their consents how often does the vehicle inspection is undertaken in the city. And almost all respondents state that the vehicle inspection is undertaken every year. But when they were asked the adequacy of the techniques employed and the relevance of inspection frequency on controlling the defect in the vehicles, 85% of the respondents indicate that the techniques used to ascertain the vehicles' road worthiness is very poor while 15 % of the respondents state the techniques are good. Similarly on the major limitations of the techniques employed, lack of employing modern inspection system (i.e. employing electronic inspection mechanism) ,lack of skilled manpower, failure to implement the required technique due to ethical problems of the operators , the techniques focuses on the minor parts by not giving due attention on the main matter need the assurance, the process is very much subjective to personal judgment(biasness) and poor organization of the inspection enterprise are the major flaws identified. Moreover, as some respondents indicated though the technique by itself has no limitation the very problem is on the operators as they are very corrupt to pass the vehicle without even making any prior inspection activities on the vehicles. And this type of problem is becoming high as the inspecting activities has been outsourced to some private bid winners since the integrity and trust worthiness of some of this organization on the ethical implementation has put as a doubt by some respondents.

Moreover 60 % of the respondents suggest for the frequency of the inspection process as it could be more appropriate if it is undertaken more often as well as taking on the spot checking as required. Finally the respondents on this issue were also asked whether any action has been taken so far on those vehicles not passing through the sated requirements 80% of the respondents indicate that there isn't any known measures applied so far on those vehicles but, the vehicles which do not pass the annual inspection couldn't get the pass inspection certificate and are prohibited to operate in the city.

4.3.6 PUBLIC COMMUNICATION

The target respondents also were asked for if there is a way of communicating the public about public events, planned road work on some routes and if alternative routes are being publicized in those conditions. Thus, while 44% and 39% of the respondents agree as information is given to the public about planned road works and planned events respectively; the rest say that no sufficient information is given to the public on those events. 56% of the respondents agreed on that, in line with those events the public is being aware about the alternative routes corresponding to those closed routes. Similarly 11% of the respondents agree that there is proper information is provided about cycling and walking routes. However the rest of the respondents have given their consents as either there is no public information provided to the public on those conditions or being neutral on the matter.

Figure4 .10: Type of traffic related Information disseminated to the public

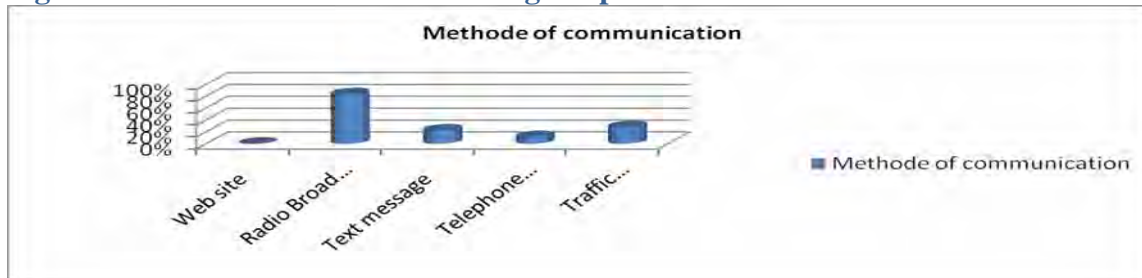


Source: Survey data 2014

In contrary a total of 75% of commercial and private operators indicate as no proper information is provided by the responsible organ about planned events, and /or road work and alternative road information to the public .while 20% state as the information are transmitted some times and 5% being neutral on the case. Moreover the respective operators indicate that though the information is communicated, its delivery is very late.

In this regard while radio broad casting is identified as a major communication method to the public about the above stated events as 83% of the respondents have put it as a major way of addressing the public on the issue. Yet use of traffic channeling and text messaging also are identified as alternative ways of communication with the public during those events. (Figure 4.11)

Figure 4.11: Method of communicating the public



Source: survey data 2014

4.3.7 DRIVERS' TRAINING, TESTING AND LICENSING

In recognition of the traffic accident occurs in the city and due to deficiency of drivers licensing and to create a uniform, standard and effective system of driving licensing free from corruption and bureaucracy nationwide, a new proclamation (No 600/2008) revised in line with transport regulation 468/2005 and improves these shortcomings is enacted. The new proclamation categorizes driving licenses in to several groups requiring passing through special theoretical and practical training and testing for each category as well as the holder of lower qualification to higher qualification. This theoretical and practical training curriculum and examination for each driving license category are prepared with the help of Ministry of Education and supported by computerized system. Hence the system has made a contribution to the enhancement of driving licensing standard and to clear the fraudulent loop which was the chain creating drivers who are lacking the required skill and safety awareness.

However, with all of its improvement, the issuance of driving license is not without some flaws, as it is mentioned by the officials in the transport bureau though there is a standardized licensing system nationwide. There is no central data base that registered and holds a record of licenses issued in all region of the nation. As a result the situation creates an opportunity to the drivers to have two or more driving licenses issued at different regional transport bureaus. For instance an operator in Addis Ababa might have a driving license issued by Addis Ababa transport bureau as well as Oromiya transport bureau. This and other things like some fraudulent activities in the respective regional as well as self-administered cities create a burden for the traffic enforcement measures exercise in the city and questioned its effectiveness.

Participant drivers described how they learnt to drive and pointed out that their training has a bearing on road use. They said almost all drivers learnt driving through formal driving training. However, some of them, especially the older drivers, seemed to recognize that the current spate of reckless driving on the part of young drivers stemmed from the inadequate training they underwent.

In their opinion, the inadequacy of driver training especially among the young ones is assuming dangerous dimensions and appears to be a source of worry for everybody.

4.4 INSTITUTIONAL ARRANGEMENT & AGENCIES INTERLINKAGE

It is fundamental to the development and implementation of a successful traffic management (TM) program that there exists, or is created a city based traffic management agency with well-defined responsibilities and accompanying powers to fulfill the tasks required for effective traffic management; an institutional framework which recognizes and legalizes, the formal role and responsibilities of the traffic management agency in relation to the traffic police and all other agencies with interests in the transport sector.

4.4.1 TRAFFIC MANAGEMENT AND ROAD CONSTRUCTION

Coordination among various actors for the benefit of the overall objective of having a smooth, safe and reliable traffic flows in the city is the concern of all.

Thus to gauge the degree of relation and coordination among the stakeholders in the traffic management operational activities the respondent in transport planning and traffic management office were asked if there is a coordination of their office and the road construction unit at the time of road design, construction and maintenance work. Thus almost 90% of the respondents said that though their office involvement is very crucial there is no clear arrangement to make them participate in those matters thus far.

And they were asked about what their specific contribution will be if they have got a chance for the participation,80% of the respondents indicated that their involvement is important as different research work which might be a useful input for the designing of road in the area, to include various traffic management techniques and safety measures by considering traffic volumes, vehicular movement patterns, pedestrian movement and other related issues that might be useful for the overall traffic management activity has been performed in their office. Beside other than the road designing work, they indicate that their involvement during the maintenance work also important as they have access to the internal and external information about the problem on the constructed road which might need some modification in order to alleviate the observed problems which might be an useful input for those units involved in the construction and maintenance work. Some respondents also put the fact that the city transport infrastructure being led by urban planner rather than transport planner as major reasons for creating some loopholes and the loosen coordination on the

matters by stressing the consideration of transport planning importance on the road construction process.

4.4.2 TRAFFIC POLICE AND TRAFFIC MANAGEMENT COORDINATION

Information about the overall vehicular road traffic patterns is the backbone of effective traffic management action. Therefore the city traffic management unit seeks information on the conditions of the roads, the level of accident on the specific area and their effect on the flow of traffic on the road network. Considering this the respondents were asked how they get that information about the condition of traffic in the city (especially road traffic accidents).

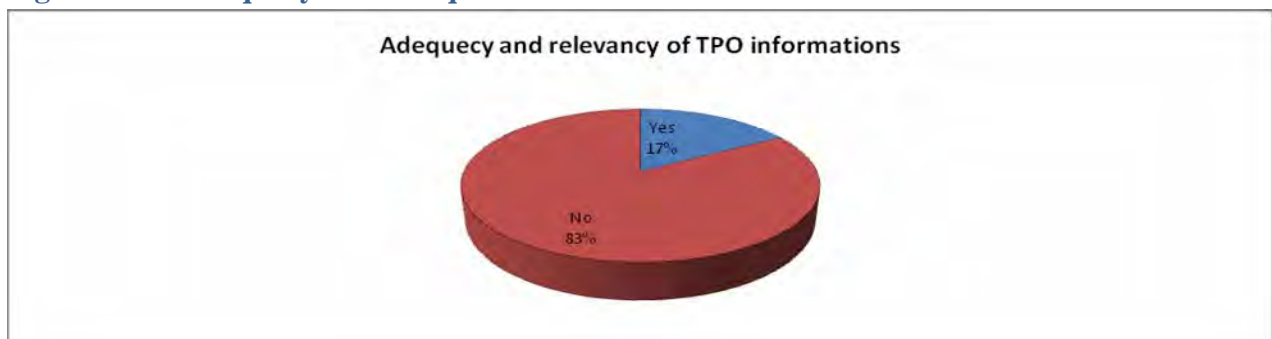
Figure 4.12: Method of gathering information about Traffic problems in the city



Source: Survey data 2014

The above Figure 14 reveals that all respondents put traffic police office as the main source of information about traffic accident occurs in the city while 17% states the transport office has also made some investigation by its own as a supplemental for traffic police information to acquire information about the accident occurring in the city and 11 % of the respondents add the formal and informal informants as a source of information in addition to the traffic police office report.

Figure 4.13: Adequacy of the acquired information



Source: Survey data 2014

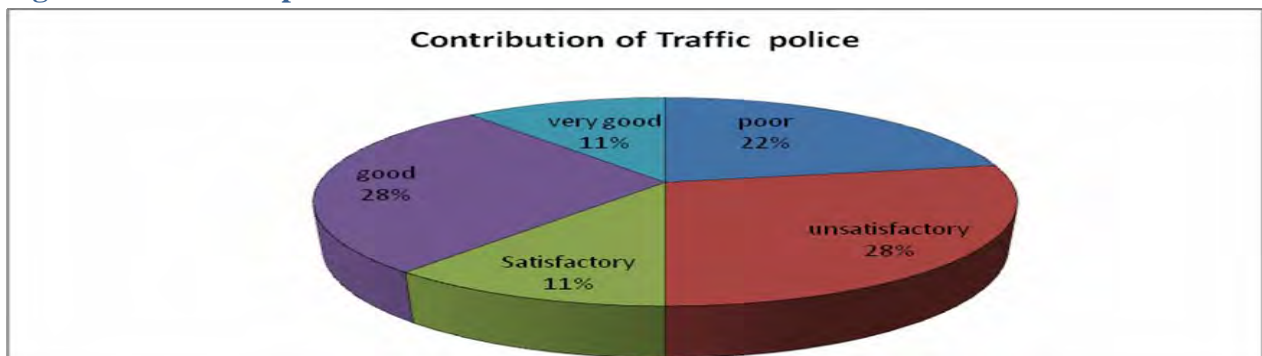
The respondents also were asked to rate the adequacy and relevancy information acquired from traffic police office. As indicated in the above Figure 15, 83% of the respondents put their doubt on the adequacy and relevance of the information obtained from the office.

Correspondingly they also requested to pinpoint the major flaws the information has that hinder their effective operations'. Yet the respondents indicated that the information are very poor as the TPO has:

- Poor information collecting and reporting methods(traditional method)
- Poor record keeping system
- Lack of sufficient skilled man power, lack of competency to undertook incident analysis
- No particular consideration is given by the officers performing the task
- Lack of Traffic control center and traffic management system (intelligent traffic control systems)
- Information are not organized and are lately delivered and not simply accessible as required

Traffic schemes should be designed to minimize enforcement efforts and to design out the ability and inclination for drivers to commit traffic offences. Nevertheless, this cannot be fully achieved and traffic schemes will always require traffic police enforcement of regulation for success. More importantly the respondents were asked to rate the traffic police contribution on law enforcement activities.

Figure 4.14: Traffic police contribution toward enforcement activities



Source: Survey data 2014

Hence as the respondent level of rating the traffic polices plays an important role in the execution of traffic related laws and rules in the city as 28 % of the respondents believe that they have a good contribution while 33% have put their contribution at a satisfactory level. And as indicated in the

Figure16 below, 28% of the respondent witnesses the poor and unsatisfactory contribution of the traffic police to ward traffic law enforcement in the city.

In addition to that, though the traffic polices are important tools to apply traffic law enforcement in the city, they have some weaknesses that in effect disturb their smoothly discharging of their obligation. To mentions some of the flaws that are identified by the respondents that the traffic polices have with respect of enforcing traffic laws:

- There is so much ethical problems on the traffic police officers as they are involved in some bribing activities,
- They put themselves as a legislative organ rather than an organ which is assigned to execute the specified rules and regulation they act at their will regardless of the rules and regulations.
- Limitation on the number of workforce assigned with respect to the volume of traffic and road network,

This results in grossly ineffective traffic law enforcement permitting operators and other road users to behave the way they like. Available transport infrastructural capacities are sub-optimally utilized, allowing current usage to impact so negatively on the environment and leaves the operation of vehicles on the roads virtually in the hands of nobody.

4.5 CHALLENGES IN TRAFFIC MANAGEMENT PRACTICES

Cities today are faced with a number of problems with respect to traffic management, as their expansion has significantly increased transport demand. Municipalities and transport authorities face the challenge of meeting this demand in the most efficient and sustainable way. However the range of solutions that can be applied is constrained by many limitations. The respondents were asked for if there are any internal and external factors that hinder the traffic management activity of the city. Thus the respondents indicated the major internal and external factors that affect traffic management activities in the city. Based on their responses the major internal and external factors identified are listed here under:

4.5.1 INTERNAL FACTORS HINDERING EFFECTIVE TRAFFIC MANAGEMENT PRACTICE

➤ Undefined Institutional Arrangement

Efficient traffic management and operations require a competent professional agency working within a well-defined institutional structure. Institutional arrangement for traffic management is the key element of a successful traffic management system. In Addis Ababa city, institutional arrangements for traffic management are weak, and the meaning of the term traffic management is undefined and its status is low and overshadowed by road authority and often city governments does not yet recognize its importance.

The traffic management office is under resourced and lacks adequate powers to initiate policy and to implement comprehensive schemes and it compromises with road authority and other agencies. The boundaries of traffic management responsibilities are neither clearly defined nor are there mechanisms for co-ordination between the authority and other agencies like traffic police office. This can lead to:

- protracted periods for scheme implementation as agencies try to reach consensus as everything is expected to be done after the establishment of committee member representing each agencies involve in the scheme;
- abandonment of schemes due to failure to reconcile the views of different involved offices;
- address the problem with prolonged delay,
- fundamental differences of view on traffic policy;
- Unilateral action by one agency (typically a road building agency with its propensity for road expansion) which can undermine the objectives of a traffic management agency attempting to balance demand and supply and to favor most efficient modes.

➤ Lack of Sufficient and Competent Man Power

Development and implementation of traffic management measures requires specialized staff skills and intensive professional staff input. The respondent says that the city traffic management office lacks these necessary staffing and staffing skills. Considering the magnitude of traffic problem in the city, the number of staff assigned to undertake the activities is only eleven (11), which signifies the level of recognition provided to the issue.

The lack of status and recognition of the importance of traffic management by cities means that there is often no career structure for staff in traffic management and this is compounded by the

likelihood of changes in staffing due to political changes. Unless a traffic management agency has both the necessary a) status, powers and funding and b) technical capability traffic management schemes and policies cannot succeed.

➤ Weak Human resource management

People are any organization's most valuable resource, and without dedicated, knowledgeable and motivated employees, the best plans will never be successful. Thus, it is necessary to provide traffic management staff with status, career paths and reasonable salaries otherwise it creates workforces with no initiation and satisfaction for their jobs. The staffs (respondents) asked to give the level of satisfaction with their job. Accordingly, while a total of 70% of the respondent have specified their dissatisfaction with their jobs, 30% of the respondents have a satisfaction with their jobs at a different degree of satisfaction level. (Figure 4.15)

Figure 4.15: Staffs level of satisfaction



Source: Survey data 2014

The respondents put the level of their salary and the condition of their working environment as the major bases for their dissatisfaction in their work. In this regard while 72% of the respondents put recognition, salary, promotion allowance, award and conducive environment as motivating factors for their better and effective performance on their jobs, the rest stated none of those things add to their level of satisfaction rather as indicated by some of them they like to see change in the overall traffic management and transportation service in the city. (Figure 18)

Figure 4.16: Staff Motivating factors



Source: Survey data 2014

The respondent said that the bureau doesn't make any effort to alleviate the staff job satisfaction as well as to acquire the better performance form the staffs. As almost all rated the level of effort made by the bureau as poor or unsatisfactory.

➤ **Poor Training and Development**

Successful and sustained traffic management requires adequate number of trained professional staff in the traffic management office. In the context of the study focus, the respondents wereasked how often they attend technical and professional development programs. (Figure 19)

Figure 4.17: Staffs participation in training program



Source: Survey data 2014

As indicated in Figure 19above, majority of the staff do not participating in skills development program. Traffic management requires a trained staff as TM is not an established part of universities-collage-institutes curricula in the city.

➤ **Lack of operational and implementation resources**

The respondents indicated there are no separate resources which are autonomously administered for scheme planning, designing, implementation and recurrent costs of operations, monitoring etc. Rather, the traffic management is both dynamic (measures should respond to changing traffic

conditions) and staff intensive for preparation, planning, design and operation. The lack of recognition that traffic management agencies need continuous financing has resulted in failure of agencies (i) to maintain, monitor, modify and optimize schemes once implemented and (ii) to recruit and retain adequate qualified staff to carry out their activities. Continued traffic management requires the provision of adequate on-going budgets for planning, designing, implementation and monitoring of measures. Therefore the issues need to be put in mind for consideration since sustainable, successful traffic management in a city is impossible without a competent traffic management agency with adequate powers and financial resources.

➤ Traditional Management Technique

Intelligent Transport Systems (ITS) seem to play an important role in urban traffic management, as cities place them fairly high in their priorities. They are generally considered as offering potential solutions to many of the cities' problems, with the vast majority of the cities having implemented ITS technologies in terms of providing information to the public and facilitating traffic management, or planning. The respondents indicate that the application of modern technology (ITS), nevertheless, have to date not been quantified and as such, no concrete application framework exists.

4.5.2 EXTERNALFACTORS HINDERING EFFECTIVE TRAFFICMANAGEMENT PRACTICE

➤ Poor Integration among Various Stack Holders

The multitude of institutional interactions necessary in order to optimize transportation operations further challenges the agency. Traffic can seldom be managed unilaterally if optimal conditions are desired. Travel patterns require interaction between agencies within jurisdictions and across jurisdictional boundaries. Thus, the actions of one agency may greatly impact the conditions under which another must labor, and the ability of an agency to optimize travel conditions will almost undoubtedly depend upon cooperation between several agencies.

According to the respondent the city traffic management is undertaken in a very fragmented manner involving three responsible organs like, ACRA, AACRTB (transport branch) and Addis Ababa Police which creates a loophole in the implementation process. Interagency cooperation should be a part of every phase of the TM, from planning through operation and maintenance. In order for the agencies to work together effectively, there should be governing mission, vision, strategy, goals,

and objectives related to the TM. These should be clearly traceable to each agency's own defining statements.

➤ Lack of Recognition

In the city, traffic management is not seen as a distinct function or discipline. Among politicians, and some specialists, the views prevail that (i) traffic problem can only be "solved" by massive capital investment in, possibly light rail, or road building and that traffic functions are of considerably lesser importance and (ii) traffic management should be undertaken as a "by-product" of the work of various other agencies such as the roads department or the traffic police or by low level, inadequately funded and trained local councils. Road building seen as a "solution" to traffic problems, but, experience shows that new roads alone will not be a long term solution there is a need to address safety and to ensure that the road network is used effectively.

➤ Poor Enforcement Capabilities

Most traffic management measures require enforcement of traffic regulations. Clearly, schemes should be made as "self-enforcing" as practicable through physical means but there will always be a need for the enforcement of the regulations by the traffic police. Many traffic police forces in the city are under-trained, under-equipped and have little understanding of the aims and objectives of traffic management. There is also the issue of corruption. Generally, for traffic offences, traffic police either issue on-the-spot fines or issue "tickets" for later payment. In both cases, it known that bribes, lesser than the statutory fines, are paid to some traffic police. There is no use of automatic enforcement procedures for traffic offences such as cameras capable of number plate recognition and which track and counter check the activities of the traffic police assigned as a result the condition create a room for the enforcement mechanism to be at the will of the assigned traffic police in the area.

➤ Poor Integration between Transport and Land Use Planning

Land-use planning is a very useful tool to guide the development of a city and to attain the desired land-use pattern. The most commonly used planning tools include master plans, strategic/structure plans and local area plans. These plans should be formulated by adopting integrated land-use and transportation planning strategies to address transportation-related issues. Since traffic management and urban land use are inseparable as enough space need to be set aside for wider roads, parking, pedestrians and cyclists. Moreover, strongly coordinated transport and land use policies allows to proactively and beneficially manage the scope and nature of urban travel demand and thus reduce the incidence and severity of congestion However, Transport planning, as an on-going and continual

process, is not undertaken in any serious manner by the city and the city has no transport planning until recently developed transport plan which is not being put in action yet.

➤ Poor Data Base System

As indicated by the informant, there is inadequate sanctions for violation of traffic regulations – the levels of fines for breaching of traffic regulations is inadequate and act as no constraining to drivers who contravene regulations for instance one operator might commit traffic offence many times in a month period and received the ordinary financial fines. In this case since there is no central and integrated data system which record the individual offence occurrence in the period of time in the city as well as nationwide it would be difficult to track the operator and put him/her in the next higher level of regulatory punishment like suspending the driver license for some time, and making the operator to attend some educational training program before issuing back the license etc. is becoming difficult task for management.

Moreover data gathered from traffic police office indicates that the city traffic incidents occurrence has recorded and reported manually there is no established system of accident data bank at the traffic office which store data useful for traffic management to carry out some remedial measure as need

4.6 PROSPECT IN TRAFFIC MANAGEMENT

The growth in the population i.e, 2%-3% leads to increased demand for travel and population pressures which in turn leads to spatial expansion of the city areas and to increased journey lengths. Moreover growth in city economies and household and personal incomes lead to further increase in travel demand, car ownership and car use. These factors, together with the inability, the cities to plan transport systems, to manage travel demand, to relate land use and transport and to provide adequate resources for transport coupled with the high cost of facilities (particularly capital intensive mass transit systems), combine to produce the common transport effects that are seen in the city today like increasing traffic congestion; increasingly high costs of travel; high levels of (road) accidents; and increasing road traffic related emissions and atmospheric pollution. One way of tackling the observed problems the establishment and implementation of sound traffic management to make the most productive use of existing roads, traffic systems and public transport by improving operational efficiency and quality . Nevertheless, regardless of seriousness of the problems the role of effective traffic management practice is not given that much attention so far. Ultimately, it is impossible for the city to construct enough roads or to create enough capacity by supply side traffic measures to cater for full, unconstrained travel demand by motorized transport. It

is demanding at some stage; have to adopt some level of traffic management as part of an integrated transport strategy.

In general term traffic management embodies a wider concept and is concerned with the comprehensive management of the road based transport system and deals with policies and measures for the entire urban transport system including traffic circulation, public transport on-street operations, management and control of parking, servicing and access demand management, enforcement of traffic regulations ,road safety, pedestrians bicycles and other non-motorized vehicles, commercial vehicles management and environmental management (such as traffic calming). However the city should adopt what is best measure work depending on the size, level of development, level of traffic problems, and traffic characteristic of the city and enforcement ability.

As it was mentioned in the previous section of this chapter the city traffic management practice is very weak and the activities that are done so far are not that much satisfactory to worth mentioning . However, with all the problems confronted by the responsible organ has initiated some short, medium and long term activity plan by organizing a unit at the project level to identifies the nature and cause of traffic problems in the city and to develop some remedial measures that would curb the traffic problem in city in the future.

➤ Introduction of Bus Rapid Transit and Light Rail

Traditionally, traffic management has been involved with the development and application of measures directed at optimizing the efficiency of urban road infrastructure. Recently, the emphasis has been more towards promoting a modal shift in favor of public transport and other environmentally friendly modes. However, the public transport especially mass transit service in the city is very weak with respect to the magnitude of the transportation demand observed in the city. That is mini and midi buses, small taxi (Lada) as well as city busses are the major provider of public transport service in Addis Ababa. Among all city bus (Anbessa) has the major modality share rout network coverage in the city.

Hence recently the Ministry of Transport adopts a plan to reform the public transport and invest in mass rapid transit solution as a supplement of the existing public transport service. The aim is to implement a network of 7 Bus Rapid Transit Corridors as well as Light Rail Transit during the coming few years.

Bus Rapid Transit (seven lines): Those lines were designed to serve the main areas of the city and to feed and complement the two LRT lines:

- B1: Ayer Tena – Tor Hailoch – Wingate
- B2: Gofa Gabriel - Mexico – Merkato – Wingate
- B3: Gofa Gabriel – La Gare – Gulele
- B4: Megenagna – Arat Kilo – ShiroMeda
- B5: Megenagna – Bole
- B6: Bole Airport – La Gare
- B7: TorHailoch – Lideta – Kera – Bole

Light Rail Transit lines (North – South and East – West axis):

- L1: Ayatt – Megenagna – Tor Hailoch – Ayer Tena
- L2: ShiroMeda – Merkato – La Gare – Kaliti

➤ Mobile Enforcement Team

Among the major flaws identified in the existing traffic management practice is the inadequacy of traffic law enforcement in the city. The team has developed a remedial measure that is used as a support for the existing enforcement activity undertaken by the traffic police office, called “Mobile Enforcement”. It is the application of “Mobile enforcement” work force that controls the overall application of traffic rules and regulations in the city roads. The workforce is composed of the traffic police, traffic management officer and drivers. The initiation is to stop the practice of unsafe driving which are identified as major causes of traffic problem like accident, congestion and enforce the law on the spot. The mechanism is believed to curb the existing traffic problems which were worsened by weak enforcement practice carried by the traffic police and also to curb the existing corruption loopholes that are practiced by some traffic police.

➤ Geometrical Improvement work

Similarly, as it is mentioned by the higher officials in the transport bureau, that there is plan to carry some geometrical improvement work i.e. redesigning the existing infrastructure work on the roundabout to curb some traffic congestion problems. Similarly, some respondents indicated that some work has been done to smoothen the traffic flow like identification of major black spots to address the problem and the implementation of yellow box (road traffic control measure designed to prevent congestion at junctions by prohibiting vehicles from entering in to the area so marked unless their exit from the junction is clear) is the major one formulated as a short term plan.

➤ Transport planning

The city thus far has no transport planning, but recently a transport planning manual has been developed to improve city planning, in particular in the integration between transport and land use and social and economic activities. Moreover to ensure that all transport investments are evaluated

objectively, prioritized and targeted within realistic budgets so that transport policies and measures are economically, financially, operationally and environmentally sound, are sustainable and form a realistic “implementable” program;

➤ Establishment of Central data base

Establishing vehicle registration and driving licenses central data base at the city and national level in collaboration with the regional transport bureau is also the future medium term plan that is initiated to standardize and capacitate the controlling mechanism nationwide. Further, modern traffic management practices by establishing traffic managing centers, implementation of GIS technology and traffic intelligence services in the future as a long term plan need to be introduced.

➤ “Smart parking” system

Whether parking management and control is achieved by physical control of the total number of parking spaces in given area – or by setting pricing for parking spaces to control demand – parking imposes limitations on user choice and aims to modify user behavior. Parking in Addis Ababa is mostly done on the street and like the drivers complains it block major transpiration arteries. The parking problem in the city demands sufficient off –street parking supply. Thus, facing with the growing economic pressure on the city transportation, supply-side measures called “Smart Parking” System is projected seeking to provide a more balanced view of parking demand and supply and to provide additional capacity or improving traffic flows by reducing bottlenecks in the city. Yet the implementation of the parking measures requires a convenient level for parking areas and an agreement with local authorities and private firms to implement the parking system.

CHAPTER FIVE CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

The increase in economic activities of the city has resulted in a massive migration from different parts of the country as well as from abroad. This resulted in a tremendous population growth and spatial expansion of the city which demand traveling of longer distance than in the past. Correspondingly, several roads are constructed to accommodate the increased mobility demand. However, increase in car ownership and car use and the inability of the city to plan transport system

in relation to land use in the city creates the common transport problem like congestion, accidents and shortage of parking and public transport facility at varying degree in most parts of the city of Addis Ababa.

Thus, traffic management as a set of strategy should be an integral part of a balanced transport strategy in any well run city with all its general rationale to make the most efficient use of traffic and transport facilities, to reduce delay due to congestion and ultimately to improve safety. The city traffic management office is established at the process level in year 2011 following the issuance of transport policy of the city. The office in collaboration with other agencies like road authority and traffic police office has some initiation and activities to curb the traffic problem observed in the city through arrangement of public enlightenment program, involve in studying and identifying major black spots and congested areas that call for the application of some traffic management tools and engineering works and taking the required controlling measure as a remedy for the problem. Moreover the office is striving for the proper application of rules and regulation in collaboration with the city traffic police for the efficient utilization of the available road network by the operators. However, the study found that these traffic management activities are very few in relation to the magnitude of the problem observed in the city.

However, traffic management in the city is very minimum and infant in its establishment and organization in the city. However, the office has not yet operated autonomously; rather the majority of the office activities are undertaken by the unit at the road authority with minimum involvement of the process. As a result many of the activities in traffic management aspect of the city are not been accomplished though it is depicted as strategy in the respective documents.

Therefore the study further try to see the reason for this unsatisfactory performance and it is found out that there are internal and external factors that hamper the traffic management practice as it is required in accordance to the magnitude of the problems. As a result, the major internal challenges that hamper the traffic management practice of the city are: undefined organization structure, lack of sufficient and competent manpower, weak human resource management, lack of training and development program, lack of operational and implementation resources and not supported by the modern technology to practice the traffic management effectively and efficiently. Similarly the study identified poor integration among stakeholders, not giving recognition for strong professional traffic management by the higher government officials, poor enforcement capability, poor integration between transport and land use plan, poor data base system are the major challenges identified as an external factors that hinder the traffic management practice of the city.

Despite all the above limitations various projects are formulated to address the traffic problem observed in the city in the future. To mention some, there is an initiation to establish a mobile enforcement mechanism to upgrade and uplift the existing practice, and to clear the existing corrupt loopholes which exist in the current enforcement application practices. Project also initiated to established a central vehicular and drivers nationwide data base to monitor and evaluate drivers with bad driving habits and for further corrective action and also to ease the traffic law regulation practice. More over to curb the existing parking problem in the city the implementation of smart parking management practice is also formulated .Furthermore, transport planning is also formulated. In addition, Bus Transit (seven lines) and Light Monorail systems are being introduced in the city recently.

5.2 RECOMMENDATIONS

Considering the overall traffic management practices of the city and its flaws the following recommendations are made to curb the traffic problems and also sustain the city transportation system as a whole.

- There is no doubt that cities require a high quality road network. However, experience shows that new roads alone will not be a long term solution and that even with new roads, there is a need to cater for efficient, to address safety and to ensure that the road network is used effectively. Thus Traffic management is essential to meet these needs. Therefore higher officials of the city should strengthen the unit to fulfill the traffic management with innovative and responsive traffic management policies with city-wide powers, responsibilities, staffing and funding that needed to plan and implement the policies.
- When designing the infrastructure, it is important to take into account the application of the full range of traffic management measures to be applied. The road network should be robust enough to deal with recurrent conditions and non-recurrent and unexpected situations – incidents, events, construction and other unusual circumstances. It is needed to deploy comprehensive and more effective traffic management measures at road construction sites by building alternative road network to absorb fluctuations in demand.
- A basic provision for the high quality and (where necessary) uniform application of traffic management is the traffic management architecture. This consists of a description of all steps needed to achieve effective traffic management: applied technology, organization, funding, interoperability, legal aspects, etc. When such a framework is in place, a clear overview,

structure and a particular standardization (everyone uses the same definitions) emerge. It is especially important that traffic engineering functionalities and requirements are linked to technical developments, so that developments better match.

- With a view to effectiveness, it is important for traffic management to be coordinated and deployed network-wide. Only then can we really solve problems instead of shifting bottlenecks and problems to different locations. Such a network-wide approach requires cooperation among road authorities, transport bureau and traffic management unit within the city and between those government organ and respective regional bureaus for a common goal, which makes it easier to share funding or for a joint project or research.
- No matter how well the traffic management system is organized, the work is ultimately carried out by individual employees. Training and education for these staff members also deserve due attention. If we wish for traffic management to be effective, broader and better coordinated there must be sufficient, competent and skilled human resource. Therefore a continuous human resource development program should be established for the existing as well the newly employed staffs.
- Traffic schemes will always require traffic police enforcement of regulations for their success. However traffic polices in the city are under-equipped, not well trained in traffic management enforcement and nor do they appreciate the role and function of traffic management. Improved and systematic training of traffic police is necessary to change and enhance the existing working practice.
- The development of existing traffic management schemes in the City is traditionally focused on the legislation of rules and regulation, and their subsequent implementation or enforcement. It is strongly recommended that the city through its planning and engineering offices apply traffic engineering principles to improve the road facilities. Such includes the provision of appropriate signage and road markings throughout the network and the installation of traffic signals at critical intersections. The presence of traffic signals at intersections would lead to more efficient progression of traffic (i.e., coordination of intersection signals) and allow enforcers to better implement rules and regulations.
- Delegating the vehicle inspection process to a private company approach is encouraging to reduce the burden work in the transport bureau officials and to fill the technical skill gap in

the office. However, close follow up should be maintained to ensure that the inspections are carried out in the proper manner.

- High quality, timely and complete traffic data are essential for the provision of timely and correct traffic information and for the deployment of traffic management measures. In Addis Ababa the vast majority of data are collected manually. The data must be collected at the right places, measured with the correct techniques and the data collected must be well combined. At this time, more integration is needed among the service providers (mostly traffic police office) for providing the information, in order to improve response times and the ability to respond quickly to the required remedial measure. Therefore, intelligence traffic management system shall be deployed for a least in gathering and processing of data.

In general traffic management strategies need a high and continuing degree of political, institutional and human resource commitment to ensure that their benefits are sustained and for this the establishment of traffic management units with appropriate authority and ability to plan and implement traffic management measures is essential.

Moreover, it is clear that as Addis Ababa continues to develop, it would have to exert more effort in managing traffic and ensuring that its status will not be tainted by problems brought about by its transportation and traffic system. As such, all sectors and stakeholders must pitch in to improve the traffic situation. Participation would give people a sense of ownership of traffic management schemes and guarantee success for the programs.

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Appendix I: Questionnaire for Transport Bureau officials

Addis Ababa University, School of Graduate Studies
Department of Public Administration and Development Management
Challenges and Prospects of Traffic Management of Addis Ababa City Administration

Dear Respondents,

The aim of the research is to collect valuable information about the practice and challenges of traffic management under the title ” *Challenges and Prospects of Traffic Management Practices of Addis Ababa City Administration* . The data gathered from you will only be used for academic purpose, for M.A. thesis in Public Management and Policy. Therefore your definite data and answers will be highly appreciated and will be kept confidential.

Thank you for your cooperation

Instruction: Please oblige me by answering all questions by putting an “X” mark on your choice. Write your opinions on some of the questions you are requested. You do not need to write your name.

Part I: General information about the respondents

Name of the office _____

Your position _____

Sex Male Female

Level of Education: BA/BSc degree and above

Diploma (12+2) Grade 12 complete and certificate (12+1)

Below Grade 12 Other (specify) _____

Years of work experience (total): 5 years and below 6-10 years

11-15 years 16-20 years

21years and above

Part II: Traffic problems

1. What are the major vehicular traffic related problems in the city?

| | Absolutely significant | Largely | Reasonably significant | To some extent | Not at all significant |
|------------------------|------------------------|---------|------------------------|----------------|------------------------|
| Traffic accident | | | | | |
| Congestion/jam | | | | | |
| Air pollution | | | | | |
| Noise pollution | | | | | |
| Parking | | | | | |
| Public transport | | | | | |
| Other (please specify) | | | | | |

2. What are the major causes of traffic accident in the city?

| | Absolutely significant | Largely | Reasonably significant | To some extent | Not at all significant |
|--|------------------------|---------|------------------------|----------------|------------------------|
| Driver's capacity and behavior | | | | | |
| Failure to give the right of way for pedestrians | | | | | |
| Over-speeding | | | | | |
| Transporting passengers with freight vehicles | | | | | |
| Excess loading | | | | | |
| Violating traffic regulations | | | | | |
| Unsafe behavior of pedestrians | | | | | |
| Animals and carts using the road | | | | | |
| Inadequate pedestrian walk way | | | | | |
| Inadequate capacity to control roadworthiness of vehicles | | | | | |
| Inadequate enforcement of traffic regulations | | | | | |
| Inadequate safety consideration of road planning, and construction | | | | | |
| Others. please specify | | | | | |

3. What are the major causes of congestion in the city?

| | Absolutely significant | Largely | Reasonably significant | To some extent | Not at all significant |
|--|------------------------|---------|------------------------|----------------|------------------------|
| Shortage of infrastructure supply | | | | | |
| population and economic growth, | | | | | |
| Vehicle break downs | | | | | |
| Traffic rule violation | | | | | |
| Influence of land use pattern | | | | | |
| Concentration of work trips in time. | | | | | |
| Inefficient traffic police | | | | | |
| Unplanned stoppage/ parking, | | | | | |
| Poor Signaling | | | | | |
| Lack of investment in transport infrastructure | | | | | |
| Reduction of road space due to road construction and maintenance | | | | | |
| On street trading | | | | | |
| Lack of bus terminals | | | | | |
| Others. please specify | | | | | |

4. What do you think are the major constituents of traffic related pollution in the city?

| | Absolutely significant | Largely | Reasonably significant | To some extent | Not at all significant |
|------------------------------|------------------------|---------|------------------------|----------------|------------------------|
| Poor vehicle maintenance | | | | | |
| Lack of clean fuel | | | | | |
| Lack of regulatory framework | | | | | |
| Others. please specify | | | | | |

Part III: Traffic management practices and challenges

5. With respect to the identified causes of traffic problem what effort has been made to curb the problems in the city?

In terms of engineering.....
.....
.....

In terms of education.....
.....
.....

In terms of enforcement.....
.....
.....

Others (please specify).....

6. What are the techniques been used to propagate road safety educational activities? (You can tick more than one choice)

- A. By including road safety in the national basic education curriculum
- B. By organizing traffic safety club and making students involve in the safety educational Program
- C. By broadcasting road safety program and campaign through mass media, exhibitions
- D. Other please specifies

7. Do you think the performed educational programs are sufficient/ adequate with respect to the magnitude of the problem?

A. Yes B. No C. No Answer

8. If your answer for question no. 7 is “Yes”; please specify the change obtained with implementation of the program.

.....
.....
.....

9. If your answer for question no. 7 is “No”; what are the limitations?

.....
.....

10. How does your office participate on road design, construction and maintenance work?

.....
.....

11. Do you think your involvement on the design; construction and maintenance work contribute significantly in curbing the existing traffic problem in the city? How?

.....
.....
.....

12. How often does the vehicle technical inspection being undertaken?

A. Every three month B. Every six month C. Every year D. more than a year

13. How do you rate the technique used and the frequency of inspection effectiveness on controlling the defect on the vehicle?

A. Poor B. Unsatisfactory C. Satisfactory D. Good E. Very good
F. Excellent

14. If your answer for question no 13 is “poor or unsatisfactory or satisfactory” what are the limitations of the techniques being used?

.....
.....
.....

15. What remedial measure is taken on vehicles which do not qualify the road worthiness requirement?

.....
.....

16. What is the management measures employed to control vehicular pollution problem in the city?

17. How does your office get information about the road traffic incidents that occur in the city? (You can tick more than one choice)

- A. By making its own investigation
- B. From traffic police office
- B. Through various formal and informal informant
- C. Others (please specify).....

18. Do you think the in formations are adequate and relevant to identify the cause and to take appropriate remedial measures?

A. Yes B. No. C. No Answer

19. If your answer for question no. 18 is “No”; what are the major limitations?

.....

20. How do you rate the performance and contribution of traffic police toward traffic law enforcements in the city?

A. Poor B. Unsatisfactory C. Satisfactory D. Good E. Very good
 F. Excellent

21. If your answer for question no. 20 is “poor or unsatisfactory and satisfactory” what are their flaws?

.....

22. Is general information provided to the public for:

| | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|-----------------------|----------------|-------|---------|----------|-------------------|
| Planned event | | | | | |
| Planned road work | | | | | |
| Alternative routs | | | | | |
| Public transport | | | | | |
| Waking /cycling routs | | | | | |
| Others please specify | | | | | |

23. What are the current methods of informing the public about situations stated under question no. 22(if any)?

| | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|----------------------------|----------------|-------|---------|----------|-------------------|
| Web site | | | | | |
| Radio Broad cast | | | | | |
| Text message | | | | | |
| Telephone information line | | | | | |
| Traffic message channels | | | | | |
| Others please specify | | | | | |

24. How do you weigh traffic enforcement measures effectiveness (financial and non- financial) on curbing traffic related problems?

A. Poor B. Unsatisfactory C. Satisfactory D. Good E. Very good
 F. Excellent

25. If your answer for question no. 24 is “poor, unsatisfactory and satisfactory” what do you think is the main reason?

.....

.....

.....

26. Do you think the under listed traffic control measures are sufficiently/adequately available in the city road so as to support the smooth flow of traffic in the city?

| | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|-----------------------|----------------|-------|---------|----------|-------------------|
| traffic police | | | | | |
| traffic light | | | | | |
| Lane Marking | | | | | |
| Signing | | | | | |
| Parking restriction | | | | | |
| Speed control | | | | | |
| Others please specify | | | | | |

27. Are there any internal and external factors that affect the traffic management activities? Please describe them.

.....

.....

.....

.....

28. Are there scientific and development activities employed to address road traffic problem and sustain the smooth flow in the city? Please specify.

.....

.....

.....

29. How do you rate the level of satisfaction with your job?

- A. Poor B. Unsatisfactory C. satisfactory D. good E. very good
- F. Excellent

30. If your answer for question no.29 is “poor, unsatisfactory and satisfactory”; what are the reason?

.....

.....

.....

31. How often do you attend for a technical and professional development program (training program) for better traffic management and operation?

A. Once in 3 months B. once in 6 months c. once in a year D. as appropriate E. never

32. What motivates you for better performance and effectiveness in your job?

| | Strongly Agree | Agree | Neutral | disagree | strongly disagree |
|-------------------|----------------|-------|---------|----------|-------------------|
| Recognition | | | | | |
| Salary | | | | | |
| Promotion | | | | | |
| Allowances | | | | | |
| Award | | | | | |
| Other pls specify | | | | | |

33. How do you rate the performance of your organization on promoting the above listed inspiration to its employees?

- A. Poor B. Unsatisfactory C. Satisfactory D. Good E. Very good
 F. Excellent

34. Do you think the available staff is sufficient and competent with respect to the degree of the task?

- A. Yes B. No C. No answer

35. Do you think that the materials and equipment are sufficiently available to undertake your job efficiently?

- A. Yes B. No C. No answer

36. If your answer for question No. 34 and/or No 35 is “No”, what do you suggest should be done to resolve the problem?

.....

37. What do you suggest/ recommend should be done to make the transport service accessible, reliable and safe to the public in the future?

.....

38. Any other information you want to add/ give?

.....

Addis Ababa University
School of Graduate Studies, Department of Public
Administration and Development Management, College of Business and
Economics

Appendix II: Interview Guides

Dear interviewee, this study is about Challenges and Prospects of Traffic Management Practice in Addis Ababa. Through the present study, this researcher hopes to gather relevant data that will provide useful information to complement the overall traffic management practice in the city and those of the institutions involved in traffic management campaign in the city.. Any information you Provide will be held in strictest confidence and be used for academic purposes only.

Thank you!

Interview Guide for key Informants (Addis Ababa transport Bureau officials)

1. What local agencies (Ministry of transport, Police, city administration, Addis Ababa road and transport office, private sector etc.) are involved in traffic management activities in the city? Please provide their names and their roles.
2. What are the identified needs and objectives based program established for managing traffic in the city? For how long has the program been set off?
3. Does your office have an operational plan that considered resources (number of staffs or resources committed/available) to provide traffic monitoring and management activities?
4. Is the public involved in the traffic management scheme as an integral part of the planning and implementation activities? How?
5. How do you rate the performance of traffic management activities with respect to the plan? What percentage of your plan is accomplished for the current budget year?
6. Is there an established controlling and monitoring mechanism for measuring the implementation performance? Is there an independent organ who measures the performance in terms of the plan?
7. How do you express the major changes (reduction in the traffic problem) that are being accomplished subsequent to the implementation of the traffic management measures?
8. Is there a sound institutional arrangement for the planning, procurement and management of traffic control equipment?
9. Do you have detailed information on individual road traffic accidents occurring in the city? Where do you get that information? How often do you receive that information?
10. Are obtained information useful and adequate to identify the cause and to take appropriate remedial measure? If no, what are their weaknesses, and how do they affect your performance?
11. Is there established system of computerized accident data bank to store detailed information on individual road traffic accidents occurring in the city? Are they accessible?

12. Is there any external factor that obstructs your office role in performing traffic management efficiently and effectively? What are they? How do they hamper your performance?
13. Is there any planned activities which are not performed due to resource (human resources, materials and financial) constraints?
14. What your office has done so far to address the internal and external problem? (How do you think of those internal and external problems can be addressed?)
15. Is there a technical and professional development program for the office's work forces in traffic control and operation?
16. Do you think the traffic problems and worsen situation related to road network expansion, population and motorization can be managed with the existing institutional structure?
17. Is there any effort made so far to direct the traffic management with modern technology support?
18. What activities does your office plan to make the road transport system suitable, safe and appropriate for road users?
 - In terms of provision of public transport services?
 - In terms of facilitating pedestrian and cyclist lanes?
 - In terms of environmental protection?
 - Land use plan and transportation planning?(what is the link between transport and urban planning?)

Interview Guide for key Informants (Traffic police officials)

1. What do you think are the major traffic problems in the city? Can you prioritize them please?
2. What do you think are the major causes of traffic incidents (accidents, jams etc) in the city?
3. What is your office duty and responsibility on addressing those problems?
4. How do you express the relationship and coordination between your office and Addis Ababa road and transport bureau?
5. Does your office have information about the traffic management plan of the city?
6. Does your office activity plan consider the city traffic management plan?
7. How do you record and report incident information occurs in the city? (manually, electronically , real time recording devices)
8. Is information on traffic incidents (car crashes, traffic congestion, etc.) shared between your office and traffic management unit? When (during accident, after incident, regularly with some time interval) and how are information transmitted?
9. Is there any remedial measures being undertook by Addis Ababa Transport bureau (traffic management unit) by using your information as an input?
10. Is there a technical and professional development program for the office's work forces in traffic control and operation?
11. Does your office adequately equipped with the required instrument to undertake the investigating and reporting of traffic incidence in the city? If no, what are the major constraints?
12. In spite of the issuance of traffic rules and regulations, the traffic problems in the city are increasing. What do you think is the major reason?

13. Do you encounter any problems to implement traffic control measure? What are those?
14. What do you think should be done in order to have a safe, reliable and accessible transport system in the city?

Interview Guide for key Informants (Drivers/ operators)

1. How long have you been driving in the city?
2. Do you think the provided training is sufficient to qualify you for driving?
3. Have you ever encountered accidents while driving? Can you explain the accident occurrence?
4. What was the reason for the accident?
5. Have you ever been penalized? What was the reason? How?
6. How many times have you been penalized for one mistakes/error/offence?
7. What types of penalty fines you received for your mistake/error? (financial or non-financial)
8. Where do you park your car? Why?
9. How many times do you service your car per annum?
10. Do you think drivers are governed by the rule of traffic control and safety instruments (like, traffic lights, road markings, signings, sit belt, restriction of mobile phone use etc.)?
11. Have you ever participated in the road traffic related educational programs?
12. Do you found those programs useful? How?
13. How do you express the traffic police contribution for the smooth flow of traffic as well as reduction of accident in the city? What do you think are their major flaw?
14. How do you get the general information about any plan events, planned road works, alternative routes, public transport others in advance?
15. Do you find that information as useful? How?
16. Do you know whom to contact for any information, question and suggestion about the overall traffic management activities in the city?