THE PRACTICE OF HAZARDOUS MATERIALS TRANSPORTATION MANAGEMENT IN CASE OF ETHIOPIAN SHIPPING AND LOGISTICS SERVICE ENTERPRISE.

A THESIS SUBMITTED TO ADDIS ABABA UNIVERSITY, SCHOOL OF COMMERCE IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS' OF ARTS IN LOGISTICS AND SUPPLY CHAIN MANAGEMENT

BY

DAWIT BERHANU

(ID NO. GSR/2754/07)

ADVISOR: - SOLOMON MARKOS (Ph.D.)

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The practice of hazardous materials transportation management in case of Ethiopian shipping and logistics service enterprise.

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School of Commerce Graduate Studies

Approved by Board of Examiners

_____	_____	_____
Advisor	Signature	Date
_____	_____	_____
Internal examiner	Signature	Date
_____	_____	_____
External Examiner	Signature	Date
_____	_____	_____
Chairman of Graduate Committee	Signature	Date

Declaration

I Dawit Berhanu Legesse, announce this research paper entitled "**The practice of hazardous materials transportation management in case of Ethiopian shipping and logistics service enterprise.**" is my own and I dare to say original research work that has not been produced by others in any other universities for any other requirements in any form. All information in this document has been obtained and presented in accordance with academic rules and ethical conduct.

Dawit Berhanu (Student Researcher)

Signature_____ Date_____

Letter of Certification

This is to certify that Dawit Berhanu Legesse has carried out his thesis work on the topic entitled "The practice of hazardous materials transportation management in case of Ethiopian shipping and logistics service enterprise." under my guidance and supervision. Accordingly, I here assure that his work is appropriate and standard enough to be submitted for the award of Master of Arts in Logistics and Supply Chain Management.

Solomon Markos (Ph.D) (Research Advisor)

Signature _____ Date_____

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List of Acronyms

ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
ESLSE	Ethiopian Shipping and Logistics Services Enterprise
GHS	Globally Harmonized System
HAZMAT	Hazardous Material
IMO	International Maritime Organization
UN	United Nation
USAID	United States Agency for International Development

Abstract

Hazardous materials sometimes referred as hazmat have been defined in different ways in the past, for instance Hazardous Materials Cooperative Research Program defined it as substances that are flammable, explosive, or toxic or that, if released, produce effects that would threaten human safety, health, the environment, or property. The term often is mostly shortened to HAZMAT. Today, Hazmats are widely moved throughout the world by all modes of freight transportation, including ships, trucks, trains, airplanes, and pipelines. Following this, the safety, security, and environmental concerns associated with transportation of hazardous materials are growing in number and complexity. As Ethiopia is in development stage the need for these materials transportation will raise throughout the country, dalliance of unloading and loading due to lack of well-organized planning of machineries, manpower and poor communication with regard to truck arrival at the customer's warehouses were the major challenges for transportation sector especially for hazmat transportation service. Transportation hazmat has been left behind meanwhile it has great impact on the environment if it creates leakage; incident; explosion and others during movement to and from site to site. So this study has been conducted with the aim of assessing Practice and management of hazardous materials transportation in Ethiopian Shipping and Logistics Services Enterprise; with a descriptive research type. To do so questioners were developed and necessary data were collected from targeted group. Lack of appropriate truck with needed capacity, lack off efficient system to monitor and evaluate hazmat transportation and lack of attention from regulatory bodies are some major gaps observed in this study. Based on the findings to solve the problems the following recommendations has been forwarded; effective training program for existing staffs, implement controlling mechanism while shipments of hazmat are on loading & unloading and departmentalization & staffing to make the responsibility of each personnel clear & specific.

Key Words: - Hazardous Material, Transportation Management

CHAPTER ONE
INTRODUCTION

The need for transportation has been growing in recent years as global market become almost day to day phenomena. In this sector safety and security will take their large share in delivering the needed frights to the final destination, in this regard some materials need special attention while they are shipped because of their character and consequences if not properly handled. Hazardous materials are the very first ones in this aspect, even if they are very crucial for industries as raw materials and finished goods by them self‟s if they are not transported in right manners as of international rules and regulation plus local ones their incidents will cause great damage on social welfare, human health and the environment also. Based on this facts and the necessity to identify the current practice of hazmat transportation in the country this study has been conducted by making its case study on Ethiopian shipping and logistics service enterprise.

1.1 Background of the Study

Hazardous materials sometimes referred as hazmat have been defined by many scholars and institutes in the past, for instance Hazardous Materials Cooperative Research Program (2013), defined it as substances that are flammable, explosive, or toxic or that, if released, produce effects that would threaten human safety, health, the environment, or property. Therefore, the term often is shortened to HAZMAT, which may be seen on road signs or to HM in government regulations include explosives, toxic substances, various types of gas, solids, flammable and combustible liquid, and other materials. These hazardous materials are very essential for industrial production process and often play a great role for one country‟s economic growth.

Though these Hazmat are used in farming and medical applications as well as manufacturing, mining, and other industries, the risks involved and the potential consequences these risks impose on human safety, health, the environment, or property, force all levels of government regulate the handling of hazardous materials particularly during transportation period.

Today, Hazardous materials are widely moved throughout the world by all modes of freight transportation, including ships, trucks, trains, airplanes, and pipelines. Besides the importance of these hazmat materials as industrial input or for further processing or product development, convert the business environment to stiff competition and in turn escalated the need for hazmat

in fastest pace. To fulfill those needs transportation plays a vital role. (Ribeiro, et. al., 2007) In addition Industrialization and growing specialization have created the need for large shipments of goods and materials over substantial distances.

On the other hand transport activity as a key component of economic development and human welfare, is increasing around the world as economies grow; it is also a key component of any logistics and supply management and economics- essentially, the logistics and costs associated with the movement of your supplies and products from A to B. Baldwin, J. R., & Gu, W. (2003).

Problems related to safety and the environment, as well as economic consequences, can emerge during any stage of transport, from the loading of the goods or wastes to the intermediate stopovers, from the possible stops to the final unloading of the goods or waste (Carosso, Luceri & Oreste, 2012). Especially when it becomes to Hazmats it can be extremely harmful to the environment and to human health since exposure to their toxic chemical ingredients could lead to the injury or death of humans, plants, and animals (Spraggins, 2007). To prevent those incidents collaboration between private sector and a different government organizations at all levels can also be taken as action, this bodies of government are also responsible for controlling the transport of hazardous materials and for ensuring that hazardous cargoes move without incident.

Moreover, following international regulations, implementing highly monitored road safety management and creating awareness to stakeholders will have a great role in minimizing such kind of material lost and damages and human life injuries and death. Consequently, every hazmat employee of a person/company required to have a security plan, who handles, performs a regulated function related to, or implements the security plan, must receive in-depth training that provides an awareness of the security risks associated with hazmat transportation and methods to enhance transportation security. The training program may include the following: General training to provide awareness and familiarization of the requirements of the Hazardous Materials Transportation Program and to enable the employee to recognize and identify hazardous materials consistent with the hazard communication standard; Function-specific training applicable to the functions the employee performs; Safety training pertaining to the following:

- Emergency response information;
- Measures to protect the employee from the hazards associated with hazardous materials to which they may be exposed in the workplace, including specific measures the employer has implemented to protect employees from exposure; and
- Methods and procedures for avoiding accidents, such as the proper procedures for handling packages containing hazardous materials; or
- Any additional department specific training (e.g., pre-trip safety inspection or the use of vehicle controls and equipment, including the operation of emergency equipment).

Generally, the safety, security, and environmental concerns associated with transportation of hazardous materials are growing in number and complexity. The private sector involved in the area and a diverse mix of government agencies at all levels are responsible for controlling the transport of hazardous materials and for ensuring that hazardous cargoes move without incident. This shared goal has spurred the creation of several venues for organizations with related interests to work together in preventing and responding to hazardous materials disaster.

Even though, the freight transportation and chemical industries; government regulatory and enforcement agencies at the federal and state levels; and local emergency planners and responders routinely share information, resources, and expertise. Nevertheless, there has been a longstanding gap in the system for conducting hazardous materials safety and security research (National Academy of Sciences, 2013). Based on this, the study will try to assess the practice of transporting hazardous material in Ethiopia and it will also try to identify the gaps and the strength in the system.

1.2 Statement of the Problem

The growing chemical, cement, textile, beverage and other local industries in recent years are creating more demand for hazardous materials. According to United Nation Country Profile report (2002), the chemical industry in Ethiopia is very young moving in fastest pace. In previous years what the sub-sector produces is limited to consumer chemicals -soaps, detergents, paints, drugs, and a few industrial chemicals like carbon dioxide, oxygen, foam, alkyd resin, caustic soda, aluminum, sulphate and sulphuric acid. To fill the demand most of the chemicals are imported from diverse countries since there are few chemical producing industries in the

country. Hazmat have significant role in many industries in the country used as raw material and ingredient.

As Ethiopia is a land locked country most of these items are transported through Djibouti corridor and distributed to different parts of the country. Arega, (2015) described that, There is dalliance of unloading and loading due to lack of well-organized planning of machineries, manpower and poor communication with regard to truck arrival at the customers warehouses, this will have great impact on operational performance of transportation management especially for the issue of hazmat transportation which needs special attention because of their character.

While transporting hazmat cargos should have to get proper attention and need to be handled in safely manner according to the international standard because of their consequence. As of the United Nation Country Profile report (2002), the environmental policy of Ethiopia has a number of provisions devoted to the management of hazardous materials including toxic chemicals, but overall the country is poor in capacity to ensure the safe use of toxic chemicals. Here the transportation concern seems forgotten and left behind meanwhile it has great impact on the environment if it creates leakage; incident; explosion and others during movement to and from site to site.

On the other hand, the transportation of dangerous goods on congested urban roads is becoming area of increasing concern for public safety and environmental awareness. The risk to population and damage to environment is a major fear to the general public and government policy makers. Very high traffic accident is also another emergent treat for the delivery of safe hazmat cargo in which contribution of goods transport is significant.

Lack of data and previous researches locally may become challenge to show the experience of transportation hazmat damage on material and human life in Ethiopia, as the researcher observed and tried to assess most of the time the issue is not getting appropriate attention by government as well the regulatory body of inland transportation. Regulations and standard of international movement in relation to hazmat have not be monitored, and lack of appropriate truck with needed capacity is highly observable gaps of the area. Import/Exporters are also unable to load and unload the cargos on time as per their promises. This long seen gap in the system of hazmat transportation can be taken as a good reason for conducting this research.

Therefore with respect to the necessity for exploring the gaps and assessing the practice and management of hazardous materials transportation in the country which can cause great damage to the society and on the economy the study has been conducted on issues related to hazmat transportation and its management system in Ethiopian Shipping and Logistics Services Enterprise.

1.3 Research Questions

Therefore, this study will address the following questions:

1. What is the practice and process of hazardous materials transportation?
2. How do international hazmat rules and regulations applied in Ethiopia?
3. Does the country have developed its own regulation on hazmat transportation? If yes who regulate and monitor it?
4. What are the current challenges and causes of failure in hazmat cargo handling systems during transportation, if any?
5. Is the current system able to handle the adjustments necessary to provide a consistent level of safety and security for hazmat transportation?
    - Is there any pre capacity assessment of truck and routs to transport hazmat?
    - Is the human resource capable of handling hazmat?

1.4 Objective of the study

1.4.1 General Objective

Generally this study has been conducted with the aim of assessing practice and management of hazardous materials transportation in Ethiopian Shipping and Logistics Services Enterprise.

1.4.2 Specific Objectives

The specific objective of the study is:-

- To assess application of related international laws or regulations.
- To determine whether the current systems are able to handle the adjustments necessary to provide a consistent level of safety and security.
- To assess availability of human resource who are capable of handling hazmat.

- To evaluate existence of pre capacity assessment of truck and routes to transport hazmat.
- To assess the current challenges and causes of failure, if any in hazmat cargo handling systems during transportation.

1.5 Scope of the Study

This study has been conducted with the scope of assessing practice and management of hazardous materials transportation in Ethiopian Shipping and Logistics Services Enterprise, even though it is possible to use other methodologies to assess the practices, the researcher selected and used descriptive type of research method.

On the other hand the study is delimited itself to all the mentioned parts of the methodology which some of them were considered as the limitation of the study.

1.6 Significance of the study

The main justification of this study primarily is on the importance of hazmat transportation management in general and its proper management would benefit the country economy, social security and environment concern.

In general the result of this study would expected to help concerned bodies which have some stake in the sector to gain some insight about the current status of the practice of transporting hazmat in the country and they will take their share so as to improve the total practice.

The research findings can help policy makers to be alarmed about the necessity of controlling and identifying hazmat transportation and make controlling procedures by adapting international regulations. Finally, the findings of this thesis can initiate other researcher‟s to make further study on Practice of managing transportation of hazardous materials especially in Ethiopia.

1.7 Limitation of the study

The major limitation of the study is related to the limited coverage of the study area, it was mainly conducted on ESLSE and other transport service providers and legislative bodies were not directly involved. As the research concerns complex socio-economical system the societal welfare part has not been covered which needs a great attention and have to be studied. The other limitation is lack of previous researches and written documents specifically in Ethiopia context.

CHAPTER TWO

RELATED LITERATURE REVIEW

2.1 Introduction

Hazardous materials (hazmat) transportation is concern to policy makers because of the serious safety, health, and environmental risks associated with the release of hazmat (Rahman, Fiondella, & Lownes, 2014). It is different from the conventional vehicle routing because of the risk associated with hazmat transportation. Hazmat routing is usually controlled by multiple criteria, making the routing suitable for multi-objective optimization Chang, Nozick, & Turnquist, (2005) as stated in Rahman, *et. al,* (2014). Further adding to the system complexity is the fact that hazardous materials transportation encompasses several different modes of transport, principally highway, rail, waterway, and air Fairfax & Virginia, (2000).

Both government and private industry have undertaken extensive efforts through regulations, programs, and initiatives to reduce the risks of transporting hazardous materials. Society is generally intolerant, however, risks from hazardous materials transportation, particularly when there is potential for multiple injuries and/or fatalities Fairfax &Virginia, (2000). UNECE states in its website, In order to ensure consistency between all these regulatory systems, the United Nations has developed mechanisms for the harmonization of hazard classification criteria and hazard communication tools (GHS) as well as for transport conditions for all modes for transport (TDG). In addition, the UNECE administers regional agreements that ensure the effective implementation of these mechanisms as far as transport of dangerous goods by road, rail and inland waterways is concerned.

2.2 Transportation management

Freight transport has been growing even more rapidly than passenger transport and is expected to continue to do so in the future. Urban freight movements are predominantly by truck, while international freight is dominated by ocean shipping. The modal distribution of intercity freight varies greatly across regions Ribeiro, *et. al,* (2007). As it was defined in Njord & Meyer (2005), transportation connects people to jobs, family, medical care, entertainment, education, and the goods needed for everyday life. Network of trade that deliver breakthroughs in technology, consumer goods that are ever less expensive, and a growing economy all are possible because of

transportation. In this regard many scholars agree on that transportation management is critical Issues in determining service efficiency, for instance Taylor, Yue & Tseng, (2005) states; the operation of transportation determines the efficiency of moving products. The progress in techniques and management principles improves the moving load, delivery speed, service quality, operation costs, the usage of facilities and energy saving. However, Khorasani, *et. al.,* (2013) agrees, Modern transportation systems are more complex and their parts are more interdependent. The effective management of modern transportation systems requires better, faster, more comprehensive information about the current and future state of the system, and better management and control tools. Trace & Blaeser (2011) define that, the challenges of effectively managing international transportation are plentiful, complex and constantly changing. However, the goals of a visionary international transportation manager are pretty clear:

- Deliver the goods at the right time, place, and in good condition.
- Reduce costs, in terms of money, time, and resources, associated with transportation and related services.
- Reduce inventory levels or safety stocks.
- Increase productivity levels of management and administrative staff.
- Reduce the carbon footprint associated with transportation and related services.
- Deliver all of these benefits regularly and reliably.

In this regard the necessity for capacity assessment in terms of trucks, transportation routes and human resource capability has great role mainly compared to its complexity to overcome the challenges and deliver needed transportation service. Schaefer *et al.* (2011) states this idea as the Transportation providers today have four clear objectives: -

- Predict demand and optimizing capacity, assets, and infrastructure.
- Improve the end-to-end experience for travelers.
- Increase operational efficiency while reducing environmental impact.
- Ensure safety and security; as part of smarter traffic solution proposed by IBM.

In the above two ideas of making transportation management smart and efficient there are common points and both agreed on making emphasis to ensuring security of cargos, reducing carbon emission and protection of the environment that can be happened from unsecured and

undetermined traffic accident. More over delivering on the right time without any damage on cargo by improving operational performance is vital.

2.3 Role of Information in Transportation

In the era of today's solutions for the acquisition and transmission of information and information systems have play an increasingly important role in the enterprises processes realization. J. L., & RAN, (2000) Stated, Data management capabilities have greatly enhanced resource management. However, accompanying the positive effects are the challenges of implementing, supporting, and funding these technologies in the world of transportation. In modern times and the realities of the market economy, information is considered as increasingly being as the one of the most important factors in the proper management and operation of the company (Dima, Skowron, Modrak & Grabara, 2010). The transportation community should encourage the following activities related to exchanging and sharing transportation data sets:

- Determine what types of data are useful in terms of planning, design, operation, safety, and maintenance of transportation facilities.
- Determine how to classify the data. ·
- Determine the format and standard for publishing data sets. For instance, the data should be saved and published in standard formats. J. L., & RAN, (2000).

Siminică & Traistaru, (2013) state that, at the beginning, in order to realize the transport process, the following information was necessary:-

- Information on the selection of mode of transport (road, rail, sea or air),
- Information about loads (size, type, quantity, weight, height),
- Information about senders and recipients (name, organization name, address),
- Start and end time (the date of dispatch of the cargo and the date of receipt of the load),

And one should bear in mind, that before the transport process was focused on turnaround time (the shorter the better) cited from J. L., & RAN, (2000).

2.4 Importance of Risk Assessment in Hazardous Materials Transportation

Transport should be characterized by reliability; loads should not get either too late or too early. An important feature is the speed of the carriage. In particular, the realization of late orders,

transport of live organisms or documents. For the transport manager is also important the ability to control and monitor the traffic, this applies particularly to shipments of high value (Rydzkowski, 2005). In the past, the former economic system, transport management in the enterprise was treated very marginally caused by lack of competition. Currently, at the market are lot of competing firms producing similar goods, as well as companies engaged in the carriage of the goods, which led to the fact that companies try to invent newer and newer technologies, marketing tricks or techniques types of traffic (Dima & Man, 2013; Vlăduţescu, 2013). Regarding to the transportation of hazardous materials, the involved transportation activities need to be supported by risk management practices. Thus, Risk Assessment is also incorporated in the hazmat transportation activities. This is also indicated by a number of scientific studies. The majority of the scientific studies related to risk assessment with regard to transportation of hazmats are Operations Research studies. They seek to provide ways of measuring the level of risk involved in the transportation of hazardous materials, by defining the probability of an event and the consequences of an occurring event (Brown *et. al*., 2007).

2.5 What is hazardous material (hazmat)?

2.5.1 Definition of Hazardous Materials

According to Austria Department of Resources, Energy and Tourism (2009), „Hazardous material" is an umbrella term used to describe any substances that, because of their chemical, physical or biological properties, can cause harm to people, property or the environment. The term collectively describes substances according to the hazard they present, and includes „dangerous goods", „combustible liquids" and „hazardous substances". "Hazardous materials are products that pose a risk to health, safety, and property during transportation" (Commercial Driver"s License Hazardous Materials Handbook, 2012).

Further As stated in Cooperative Research for Hazardous Materials Transportation (2005) and the federal Hazardous Materials Transportation Act of (1975), define a hazardous material as a "substance or material that, if not regulated, may pose an "unreasonable risk to health, safety, or property when transported in commerce."

2.5.2 Classification of Hazardous Materials

Thousands of dangerous substances are listed in regulations worldwide. The most widely accepted classification of dangerous goods identifies nine classes of dangerous substances according to the type of danger (toxicity, corrosivity, flammability, reactivity) (Agreement concerning the international carriage of Dangerous Goods by Road (ADR) 2010). As United States Department of Transportation and United Nation Classification of dangerous substances for a screening of hazards, the regulatory classification system for hazardous materials is:-

Table 1: UN Classification of dangerous substances

UN Class	**Dangerous Substance**	**Classification**	
1	Explosives	1.1-1.6 Explosive	
2	Gases	2.1	Flammable Gas
		2.2	Non-flammable, non-toxic Gas
		2.3	Toxic Gas
3	Flammable Liquid	Flammable Liquid	
4	Flammable Solids	4.1	Flammable Solid
		4.2	Spontaneously combustible substance
		4.3	Substance which in contact with water emits flammable gas
5	Oxidising substances	5.1	Oxidising substance
		5.2	Organic peroxide
6	Toxic substances	6.1	Toxic substance
		6.2	Infectious substance
7	Radioactive material	Radioactive material	
8	Corrosive substances	Corrosive substance	
9	Miscellaneous dangerous goods	Miscellaneous dangerous goods	

International Finance Corporation Environmental, Health and Safety Guidelines (2001), also classify in the same way, as follows:

- Explosives
- Toxic or flammable gases
- Flammable liquids
- Flammable solids
- Oxidizing substances
- Toxic and infectious substances
- Radioactive material
- Corrosive substances
- Miscellaneous dangerous material.

2.6 Hazardous materials (HAZMAT) Transportation Risks

Hazards usually are divided into different types: Natural, socio-natural, man-made or technological, and social hazards. According to Lavell (2000) , the natural hazards are those related to natural phenomena, such as meteorological, geo-technical, geological, or oceanographic hazards; socio-natural hazards are those related to social processes that transform the natural environment and resources in such a way that new hazard types are created. An example of a socio-natural hazard will be slope mining at the base of hills, which may lead to an increased probability of landslide occurrence. Manmade or technological hazards include a wide range of different phenomena related to existing technical and technological conditions and the levels of insecurity they signify. For instance, contaminations of earth, water and air by toxic materials and explosions and conflagrations caused by an accident involving flammable materials. Social hazards refer to conflict situations ranging from war to civil strife and violence, including terrorism and the use of damaging artifacts; as briefly denoted in Ernesto & Castillo (2004), Route Optimization for Hazardous Materials Transport.

Hazards from naturally occurring substances depend not only on the concentration of the substances but also on their chemical form and the surrounding environment. A risk assessment is undertaken to determine whether the natural geology and environment can continue to accommodate the substances without causing an adverse impact on human health or the environment. This is done by confirming the concentrations of the substances and comparing

those concentrations with published criteria or threshold levels that are likely to cause harm to human health or the environment. However, threshold levels and published criteria are often „guidelines", and site-specific levels are often more suitable because of variations in geological and environmental conditions (Hazardous Materials Management, 2009).

According to Comto is & Slack (2007), in restructuring the maritime transportation industry: Global overview of sustainable development practices; One of the most important maritime trade activities concerns the movement of heavy chemical products, including sulphuric acid, phosphoric acid, nitric acid, caustic soda, hydrochloric acid, ammonia, alcohol, animal and vegetable oils and fats, petrochemical products and coal-tar products. The main issue is for shippers to avoid accidents and to answer the quality standards fixed by the International Maritime Organization (IMO). Problems related to safety and the environment, as well as economic consequences, can emerge during any stage of international transport, from the loading of the goods or wastes to the intermediate stopovers, from the possible stops to the final unloading of the goods or waste (Carosso, Luceri & Oreste, 2012).

International Finance Corporation Hazardous Materials Management Guidelines (2001) indicates potential hazards involving Hazmats are assessed by reviewing: (i) the project and/or industry accident history, if applicable; (ii) potential worst case impacts as a result of an accident; and (iii) more realistic impacts as a result of an accident. In addition federal exchange ground conditions and requirements describe as all packages containing hazardous materials must be properly classified, described, packaged, marked, labeled and in proper condition for transportation according to applicable DOT regulations and FedEx ground requirements.

Reduction of hazardous material (hazmat) transportation risks can be achieved in many different ways. Some of these risk reduction measures, such as driver training and regular vehicle maintenance, have little connection to modeling and operations research (OR), whereas others offer interesting challenges to OR (Barnhart & Laporte (Eds.) (2007).

2.7 International Hazmat Legislation and regulation

The transportation of hazardous materials is governed by a great number of regulations from an international to a national and regional level. The growth of international movement of dangerous cargoes has marked the acceptance of international regulations related to hazmat

transportation and the harmonization at a national level. These regulations are continuously evolving, as the socio-technical system of hazardous materials transportation passes through its life-cycle, reaches its peak and be reborn when a new technology regime appears (Amalberti, 2013).

2.7.1 Who regulates international shipments?

Tasoula, (2015) in his thesis described, the most important regulations that govern the transportation of hazardous materials are:

International Regulations

- The UN Model Regulations
- The International Civil Aviation Organization (ICAO) developed regulations for the transportation of dangerous goods by air based on the UN Model.
- The International Air Transport Association (IATA) builds on the UN/ICAO rules and incorporates individual airline and governmental requirements into their Dangerous Goods Regulations document.
- The International Maritime Organization (IMO) which developed the International Maritime Dangerous Goods (IMDG) Code, governing all shipment of dangerous substances on the high seas.

On the other hand Comtois & Slack,(2007)stats, The International Maritime Organisation (IMO) is the main international organization responsible for providing mechanisms for inter-governmental cooperation in regulation and practices related to all technical aspects affecting international shipping.

2.7.2 Similar legislative experiences in Africa region

Bureau for industrial cooperation of in its thematic area of harmonisation of transportation of awkward and hazardous loads which is a part of preparation of the East African transport facilitation strategy, shows the conditions and situation for the transportation of hazardous goods by presenting in table form the East African Community states which include Tanzania, Kenya, Uganda, Rwanda and Burundi. In the table the status of transportation regulations or laws and legal framework that govern the transportation of such goods where highlighted.

Table 2: Status and Legal Framework for Transportation of Awkward and Hazardous Loads

Country	Law/act	Regulation	Remarks/ Recommendations
Tanzania	The Transport Licensing Act, 1973 Atomic Energy Act no. 7 (2003)	Transport licensing for both passengers and cargo Safe Transportation of Radioactive Ores	Covers all cargoes Covers Radioactive materials
Kenya	Traffic Act (Cap 403)	Traffic and transportation licensing	Cargoes not clearly defined
Uganda	Traffic and Road Safety Act, 1998 (Cap 361)	Traffic and transportation licensing	Cargoes not clearly defined
Rwanda	Law no. 39/2001 of 13th Sept. 2001, Rwanda Regulatory Agency, Article 8. Carriage of Dangerous Goods.	Transport of cargo by road	
Burundi			

2.7.3 Some legal frameworks of Ethiopian

Ethiopia as part of international trade community has adapted some legal frame works in transportation sector, for instance Proclamation NO.300/2002 Environmental Pollution Control Proclamation has identified in part two control of pollution starting from number two

1. Any person engaged in the collection, recycling, transportation, treatment or disposal of any hazardous waste shall take appropriate precaution to prevent any damage to the environment or to human health or well-being.
2. The importation, mining, processing, keeping, distribution, storage, transportation or use of radioactive substances shall be subject to a permit from the competent agency.
3. The importation, preparation, keeping, distribution, storage, transportation or use of a chemical categorized as hazardous or of restricted use, shall be subject to a permit from the Authority or the relevant regional environmental agency or from any other competent agency.

Another important regulation set by Ethiopian government is proclamation no. 547/2007 a proclamation to amend carriage of goods by land. In this document sub part three performance of the contract of carriage number 26 about dangerous goods

1 When the sender hands goods of a dangerous nature to the carrier, he shall inform the carrier of the exact nature of the danger and indicate, if necessary, the precautions to be taken.

2 If this information has not been entered in the consignment note, the burden of proving that the carrier knew the exact nature of the danger constituted by the carriage of the said goods shall rest upon the sender or the consignee.

Also the country has ratified The International Maritime Organization convention on liability and compensation for damage in connection with the carriage of hazardous and noxious substances by sea adopted in 1996, to be effected from 15th day of May, 2009. The responsibility relies on Ministry of Transport and Communications, to undertake in cooperation with the concerned governmental organs all acts necessary for the implementation of the convention.

Summary of related literature review

In the above section definition of Hazardous Materials and their classification have been reviewed, so as the materials need serious attention role of information while they are transported has great role and this has been supported by related literatures. In making the practice good and better as possible as international ones activities like risk assessment will have great roles. This may include as indicated in the literatures above rout analysis, record keeping, planning and other.

In making the study more brief and associate it with best practices internationally, Hazmat legislation and regulation has been assessed and reviewed there, in having guiding principle regulatory bodies will be the one as seen in international practice who make the implementation realistic; in relation with this assessment and review has been made. As part of assessing the practice making sure of existence of some legal frameworks in Ethiopian have to be done. So based on this fact related proclamations has been discussed and showed in the literature, and they make insight of what has the country done so far.

Finally the concept of having structured and integrated transportation of dangerous goods and environmental system has been adapted to come up with best recommendations and showing best practices form international perspective. All the concepts showed necessity of having

regulated and properly monitored hazmat transportation practice, in doing so risk assessment and proper planning for it has been agreed in all literatures.

Concepts

The total dangerous goods and spill costs to a road, and its environment are a function of the DG traffic accident and its consequences. In order to achieve cost-efficient risk exposure strategies the goal of the optimization must be the minimization of the total costs subject to technical, environmental, and capacity constraints

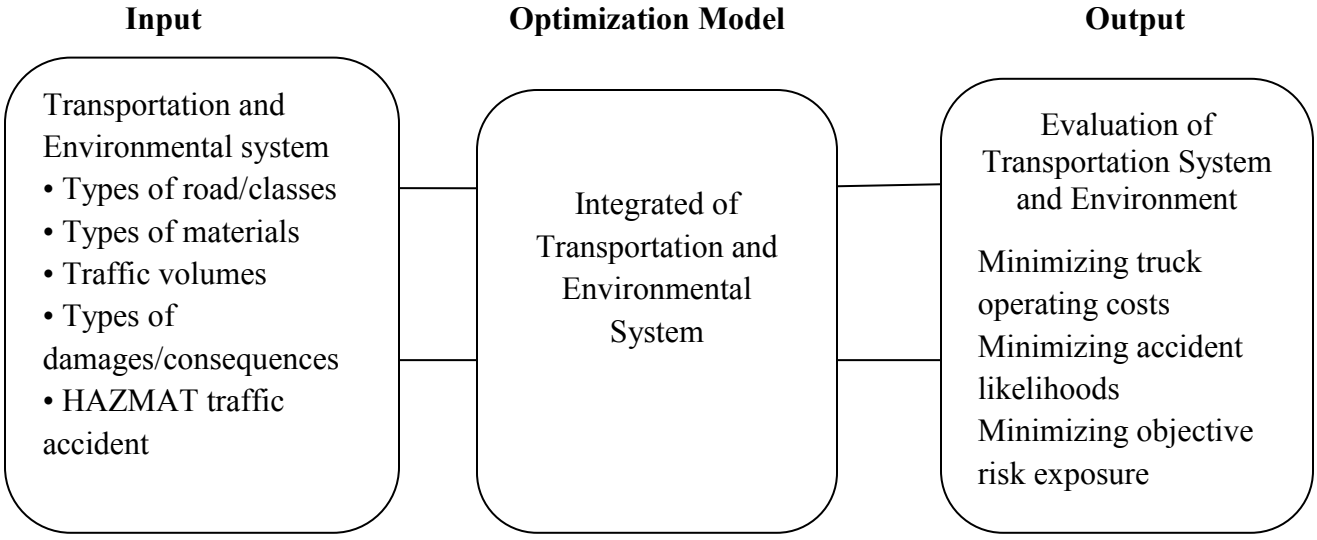


Figure 2.1 Structure of the integrated transportation of dangerous goods and environmental system

Adapted from JO Oluwoye, 2007

CHAPTER THREE
RESEARCH METHODOLOGY

3.1Study Design

This research is descriptive type in nature by having main objective of assessing Practice and management of hazmats transportation management which can cause great damage to the society and the economy. Descriptive studies are usually the best methods for collecting information that will demonstrate relationships and describe the world as it exists. Therefore, this research has been conducted to identify the gaps by assessing the current practice as it is and forward possible solution which can enhance the capacity of hazmat transportation.

In this study the researcher use of both qualitative and quantitative data in a mixed form which is helpful in designing and validating an instrument that has been deployed on this study. So far it will also help to create a phenomenon of explaining and interpreting the current state in better way that has helped to come up with improved findings of the current practice in hazmat transportation system.

3.2Data type and sources

The research has used two types of data, quantitative and qualitative. As the sources of data for more tangible outcome, the study has used primary data gathered through standard questionnaires which have both close and open ended structure adapted from USAID transportation assessment tools in the case of experts of transport within the Ethiopian Shipping and Logistics Service Enterprise and other stakeholders mostly related within the enterprises. Interview was also conducted in unstructured way with functional managers. The study also used Secondary data in the case of legal documents, international hazmat transportation regulation and organizational records.

3.3Target population

This study has targeted Ethiopian Shipping and Logistics Service Enterprise (ESLSE) which is purposively selected due to its large capacity and by owning 11 Vessels, 9 of which are dry cargo ships with a total carrying capacity of 400,000 tons at a time (i.e. an average of 300 containers by

each vessel), and the other two are oil tankers, each capable of transporting 42,000 Metric tons of oil which is hazmat classified under Class 3: Flammable Liquids.

This makes it suitable enterprise to conduct this study on ESLSE; not only this in its huge responsibility of rendering sea-transport and logistics services to the country‟s importers, exporters, and investors in a more effective and efficient way, by reducing transit time, cost and handoffs. Besides, a truck operating company named Comet Transport SC has recently been transferred to ESL following a government decree issued in the mid of 2014. It is inclusive of both sides of inland and sea hazmat transportation system.

Within total population of ESLSE the researcher has gathered primary data in transportation departments from experts of transport in the form of censuses from all 60 staffs. This provides a true measure of the population (no sampling error) and detailed information about small sub-groups within the population is more likely to be available. Others staffs in the enterprise which have relation to hazmat transportation and managers of transportation departments has been included in the interview. To do so the researcher has used purposive sampling technique, Dawson (2002) states purposive samples are used if description rather than generalization is the goal; so this study is also conducted on a descriptive base and try to assess the practice of hazmat transport system.

3.4Procedure of the study

Pilot testing has been conducted in some selected group to test the appropriateness and the language clarity of the data collecting tools. After testing the result correction has been made based on the feedback, the final form of the questionnaire has been set and the actual research have been conducted.

3.5Data analysis and presentation

To analyze the data gathered, through interview and questionnaire the researcher has employed different techniques by using descriptive analysis (i.e. frequency distribution, percentiles and percentile ranks, mean and cumulative frequency). Besides, tables, and pie charts has been employed to present the data.

3.6 Validity

Validity has been established using a pilot testing. Hence, the type of validity to use depends on the objectives of the study. The objective of this study is assessing Practice and management of hazardous materials transportation in Ethiopia by making its especial focus on Ethiopian Shipping and Logistics Services Enterprise. Result of the pilot testing has shown the questions meet aimed objective, so based on it the researcher proceeds to main part of data collection. Moreover to assure content validity this research has employed close ended questions to avoid which helps to find precise answer and avoid irrelevant ones.

3.7Reliability

Reliability has been established using a pilot test by conducting pilot testing on the same organization from 11 respondents. Data collected from pilot test has analyzed using SPSS (Statistical Package for Social Sciences). In this study Cronbach alpha coefficient generated by the use of SPSS was used to ascertain reliability of the questionnaire. The value generated was compared with the threshold of 0.7 to confirm reliability. The result found has shown value of above the threshold as seen in table 3.8.

Table 3.8

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.876	.813	34

3.8Ethical consideration

Prior to data collection appropriate ethical clearance has been obtained from the ethical clearance committee of Addis Ababa University. Confidentiality has been ensured for the information by not recording the name of the respondent or other identifiers. In conducting this study, respondents have informed in advance that the data collection process was carried out whenever they were willing to cooperate.

In addition to this, any information collected through the instrument would never be used for any other purpose other than its academic intent (i.e. the data would be kept confidential). They were also being informed that the copy of the study will be provided to them if they wish.

3.9 Organization of the paper

This study consists of five chapters. The first chapter covers the introduction that includes background of the study, statement of the problem, objective of the study, significance of the study, scope and limitation of the study. The second chapter discusses the related literature review on hazmat transportation management, transportation management and multimodal transportation. The third chapter deals with methodology of the study; Chapter four deals with data analysis and presentation. Finally, chapter five is about the conclusions drawn and recommendations made by the researcher.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

This study has targeted Ethiopian Shipping and Logistics Service Enterprise (ESLSE) which is purposively selected due to its large capacity rendering sea and land transportation with its of dry cargo ships with a total carrying capacity of 400,000 tons at a time (i.e. an average of 300 containers by each vessel), and the other two are oil tankers, each capable of transporting 42,000 Metric tons of oil which is hazmat classified under Class 3: Flammable Liquids.

ESLSE; also has huge responsibility of rendering sea-transport and logistics services to the country‟s importers, exporters, and investors in a more effective and efficient way, by reducing transit time, cost and handoffs. Moreover, a truck operating company named Comet Transport SC has recently been transferred to ESL following a government decree issued in the mid of 2014. Within the total population of ESLSE primary data was planned to be collected from all 60 staffs which are experts of transport within the enterprise by using census survey. But form the distributed 60 questioners 54 were collected the rest 2 was returned unfilled and 4 were not responded thus resulting in 90 percent response rate.

Then the collected data was summarized, organized, categorized, arranged and structured to make it meaningful and manageable size; And then the data was analyzed both quantitatively and qualitatively. Descriptive statistics was used to questions demanding quantitative measurements by using Statistical Package for Social Science Version 20.0 (SPSS). On the other hand, narration was used to qualitative measurements such as perception of respondents.

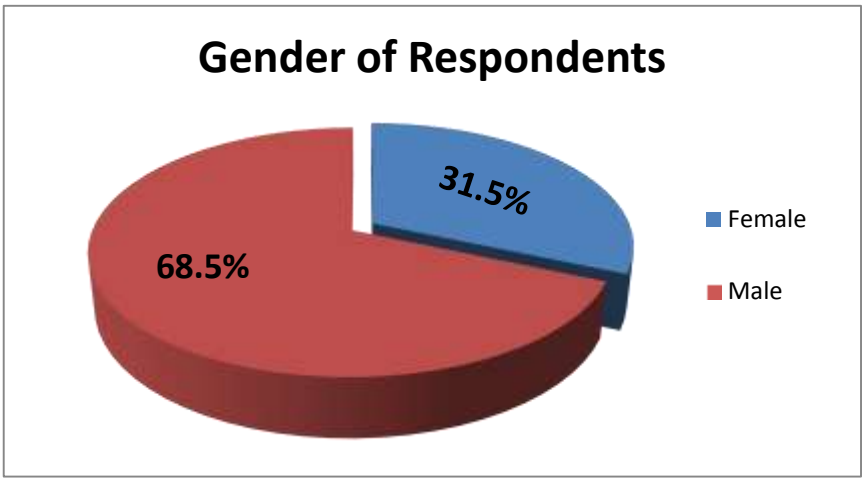
General Information of Respondents

In this section the respondents Gender, Educational qualification and Experiences were discussed and showed in detail.

4.1.1 Gender of Respondents

As per the questioner distributed it is observed out of the total 54 respondent majority of them which accounts about 68.5 percent were males and the remaining 31.5 percent were females as shown in the figure 4.1.

Figure 4.1. Gender of The Respondanent



Source: - Researcher own work, 2016

4.1.2 Educational Qualification of respondents

As the data collected from the respondents shows 88.9 percent of the respondents are Bachelor degree holders which is considered as most of them in the targeted enterprise of this study are educated people; and expected to be they know about international regulation of Hazmat transportation. Moreover they are expected to update their self‟s with newly amended regulations and technologies which help to regulate and facilitate hazmat transportation service. In his study the lowest level or respondent educational level is Diploma which accounts 7.4 percent only and the highest level of education is Master‟s Degree with a total of 3.7 percent.

Table 4.1.2 Educational Qualification

Qualification	Frequency	Percent	Cumulative Percent
diploma	4	7.4	7.4
first degree	48	88.9	96.3
masters	2	3.7	100.0
Total	54	100.0	

Source: - Researcher own work, 2016

4.1.3 Experience of respondents

In the finding of respondents asked to indicate their working experience are presented in Table 4.1.3 the results indicates that 74.1 percent of the respondents had worked for 1-5 years, 18.5 percent of the respondents indicated that they had worked for 6-10 years while 3.7 percent of the respondents said they have worked for 11-15 years and the rest 3.7 percent indicated that they have over 16 years of experience. The results indicates that majority of the respondents have 1-5 years of experience in the area and this is indication that they understand the practice of hazmat transportation system and their requirements as well effect of on human health, environment, society if improperly managed and transported. Table 4.1.3 below shows the results discussed above.

Table 4.1.3 Experience of respondents

Experience	Frequency	Percent	Cumulative Percent
1-5 years	40	74.1	74.1
6-10 years	10	18.5	92.6
11-15 years	2	3.7	96.3
above 16	2	3.7	100.0
Total	54	100.0	

Source: - Researcher own work, 2016

4.2 Descriptive analysis

4.2.1 Applicability of international rules & regulations of hazmat transportation

For the purpose of data gathering the questioner were designed in likert scale of 1-5, to show respondents level of agreement on the issues; then after impact of each variable were measured by assigning weights to the extent of agreement or disagreement with each item as shown below:

1=Strongly Disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly Agree

Responses observed from the experts to asses practice and management of hazmat transportations as illustrated in table 4.2.1 has been analyzed. Based on this, the scores of strongly disagree and disagree have been taken to represent a variable with a mean score of less than 2.5 and The scores of Neutral have been taken to represent a variable with a mean score of 2.5 the score of agree and strongly agree have been taken to represent a variable with a mean score of greater than 2.5, each question in the table has been analyzed on this base.

Transportation of hazardous materials is governed by a various international regulations, to move with the current competition and to fit in global service rendering market regulated by this rules and regulation has great role. The first objective of this study was also to make assessment on the implementation and applicability of international rules an regulating in the enterprise, results indicate there has been a good practice of implementing and working according to them. This was confirmed with the mean score of 3.91 and it is in the range of agreement. Therefore it can be considered as ESLSE is working in accordance with international requirements and regulations which is good practice for transporting Hazmat without potential damages beside other needed ways of additional safely transporting methods.

Table 4.2.1 Result for applicability of international rules & regulations of hazmat transportation

Question Item	**Level of agreement**	Frequency	**Percent**	**N**	**Mean**
Applicability of international rules & regulations of hazmat transportation	Strongly disagree	5	9.3%	54	3.91
	Disagree	2	3.7%		
	Neutral	10	18.5%		
	Agree	13	24.1%		
	strongly agree	24	44.4%		

Source: - Researcher own work, 2016

4.2.2 Transportation allocation taking into account the service delivery priorities to Hazmat

As the study aim is to assess hazmat transportation management practice in this part of data gathering it tries to view the enterprise practice of allocating priorities to hazmat transportation. In hazmat transportation considering appropriate priorities while they are transported and in planning the movement will have benefits of protecting incidents caused by failure in handing and moving them rightly. Responses to this the mean score implies 3.76 which is fall in range of agreement. Form this it can be observed allocating hazmat by taking into account the service delivery requirements to Hazmat in the enterprise have been observed as good practice

Table 4.2.2 Level of priority for hazmat transportation service

Question Item		**Frequency**	**Percent**	**N**	**Mean**
				54	3.76
Transportation allocation taking into account the service delivery priorities to Hazmat	strongly disagree	4	7.4		
	disagree	7	13		
	neutral	12	22.2		
	agree	6	11.1		
	strongly agree	25	46.3		

Source: - Researcher own work, 2016

4.2.3 Practice of planning for periodic movement of each hazardous material transportation

In this question the researcher try to assess the practice of planning periodic movement schedule for hazmat shipment requirements from the customers, and the existence of standard delivery time for each type of shipment. In the responses obtained 3.44 mean score was seen with agreement response level. The result in general shows the enterprise has not plan constantly for delivering each hazmat in a given time. As a business firm planning must have to be implemented including all aspects that have to be done next. The table below illustrates the result of respondents more.

Table 4.2.3 Practice of planning for periodic movement

Question Item		**Frequency**	**Percent**	**N**	**Mean**
				54	3.44
Practice of planning for periodic movement of each hazardous material transportation	Strongly Disagree	4	7.4		
	Disagree	5	9.3		
	Neutral	18	33.3		
	agree	17	31.5		
	Strongly agree	10	18.5		

Source: - Researcher own work, 2016

4.2.4 Existence of routine analysis to compare actual trips to the scheduled trips

To have an accurate plan which can elevate problems that can hinder success of rendering consistent transportation service make assessment/evaluation of routine by compare with actual trips will help to the scheduled the next trips. As a result the finding in this area has shown some gaps have been there, route rationalization can reduce mileage, accident probability, release probability, population exposure, and risk. The specific result observed from the data gathered in this study shows the existence of problem about the issue of routine comparison of each actual trip with the scheduled ones. As the table below show 3.44 mean score which implies their reference on level of agreement observed.

Table 4.2.4 Existence of routine analysis to compare actual trips to the scheduled trips

Question Item		Frequency	Percent	N	Mean
				54	3.44
Existence of routine analysis to compare actual trips to the scheduled trips	Strongly Disagree	3	5.6		
	Disagree	6	11.1		
	Neutral	21	38.9		
	agree	12	22.2		
	Strongly agree	12	22.2		

Source: - Researcher own work, 2016

4.2.5 Practice of setting evaluation mechanisms for hazmat transportation management

Setting extra evaluation mechanisms for hazmat transportation management to insure hazmat transportation safety with necessary actions has vital role. To do so using controlling mechanisms like; placarding hazmat and marking in conformity with international standards while they are shipped; requiring for certificate of approval for each transport unit or element to be shipped can be mentioned as tools.

Responses form the respondents reflect there has been practice of evaluating hazmat transport management; these was showed by 3.52 mean score which ranges in the level of agreement. The table below shows the score in detail.

Table 4.2.5 Practice of setting evaluation mechanisms

Question Item		**Frequency**	**Percent**	**N**	**Mean**
				54	3.52
Practice of setting evaluation mechanisms for hazmat transportation management	Strongly Disagree	8	14.8		
	Disagree	8	14.8		
	Neutral	6	11.1		
	agree	12	22.2		
	Strongly agree	20	37.0		

Source: - Researcher own work, 2016

4.2.6 Practice of insuring hazmat transportation with necessary actions

In this section the researcher forwarded questions designed with likert scale of 1-5 for data gathering; then after impact of each variable were measured by assigning weights to the extent of agreement or Disagreement with each item as shown below:

1=Strongly Disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly Agree

As shown in the table 4.3.6 each mean score with its corresponding frequency and percentile was observed.

Table 4.2.6 Practice of insuring hazmat transportation

Question Items		Frequency	Percent	N	Mean
Using means of identification on transport crew	Disagree	3	5.6	54	3.22
	Neutral	37	68.5		
	agree	13	24.1		
	Strongly agree	1	1.9		
	Total	54	100.0		
Hazmat placarded and marked in conformity with international standards to be shipped by Your organization	Strongly Disagree	4	7.4		3.70
	Disagree	5	9.3		
	Neutral	10	18.5		
	agree	19	35.2		
	Strongly agree	16	29.6		
	Total	54	100.0		
level of integration with outsourced hazardous materials transport service providers	Strongly Disagree	4	7.4		3.39
	Disagree	10	18.5		
	Neutral	15	27.8		
	agree	11	20.4		
	Strongly agree	14	25.9		
	Total	54	100.0		
level of information exchange with hazardous materials transport service users	Strongly Disagree	9	16.7		3.26
	Disagree	4	7.4		
	Neutral	13	24.1		
	agree	20	37.0		
	Strongly agree	8	14.8		
	Total	54	100.0		
Requirement for certificate of approval for each transport unit or element.	Strongly Disagree	4	7.4		3.78
	Disagree	3	5.6		
	Neutral	10	18.5		
	agree	21	38.9		
	Strongly agree	16	29.6		
	Total	54	100.0		

Source: - Researcher own work, 2016

Despite the fact from the above response in this segment different level of agreements were observed, based on the result from the analysis it‟s observed that there was an indication of problem with response on means of identification of hazmat transport crew. This was indicated by mean of 3.22 score, which is according to the point allocated fall into agreement level range. On the other hand putting placarded and marked in conformity with international standards on Hazmat which are planned to be shipped by ESLSE has scored responses with a mean value of 3.70. This indicates there has been good practice of putting placarded and warnings in hazmat cargos.

In such process having accurate information about cargo safety, insuring security throughout their rout have to be assessed in comparison with prior experiences and finally setting extra controlling mechanism in conformity with internationally advisable necessary actions has crucial part in being world class transportation and logistics service provider. In this information era being able to communicate with customers on frequent and precise base has many benefits, in this study the researcher tries to assess information exchange level among the customers considered to be outsourced and customers in need of service. As of the questions forwarded to assess the level of information exchange with hazardous materials transport service users and level of integration with outsourced hazardous materials transport service providers the mean score of 3.39 and 3.26 were scored accordingly. From this point it can be observed the two points has showed agreement level of response. In this section the last response gathered from the respondents for Requirement of certificate/approval for each transport unit or element from the respected party the responses indicate a mean of 3.78. Therefore as per the score we can say the enterprise is in practice of requiring certificates and approvals for the cargos that have to be transported through them.

4.3 Adapting international rules and regulations and monitoring hazmat

International cross boundary hazardous materials transportations have been ruled and directed by number of regulations beginning from national and regional level up to international one, in this view adapting international rules and regulations and monitoring them will rely on responsible bodies as per the countries structure. Customization of International rules & regulation especially on hazmat will have impact on the practice of rendering transportation service. Such kind of process may involve setting own control, preparing manuals and directives, prerequisite of

documents and similar activities which are believed to be significant to giving quality service. Ethiopian as a country has made proclamations to govern movements, importation and pollution caused from hazmats to the environment and human being. Based on the aim of this study the researcher develops questions in likert scale of 1-5, by assigning 1=Strongly Disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly Agree levels accordingly. Since the questioners were distributed to the respective department experts to assess the practical working experience responses are analyzed and showed in the following sections.

4.3.1 Adaptation and customization of International rules & regulation

Reactions for the question about adaptation and customization of international rules and regulations has showed there has been a broad gap in creating knowledge to stakeholders which may cause hindrance on its applicability. As it was assigned to this study scores of Disagree have been taken to represent a variable with a mean score of less than 2.5, responses after analysis has been found to score a mean of 2.37. So we can observe that there has been working environment only with international rules and regulation even though there are proclamation governing hazmat movements locally. It is also indicator of there has been lack of linkage between the stakeholders about hazmat cargo transportation. Table 4.4.1 has shown all data information gathered.

Table 4.3.1 Adaptation and customization of International rules & regulation

Question Item		Frequency	Percent	N	Mean
Adaptation and customization of International rules & regulation.	Strongly Disagree	12	22.2	54	2.37
	Disagree	26	48.1		
	Neutral	4	7.4		
	agree	8	14.8		
	Strongly agree	4	7.4		
	Total	54	100.0		

Source: - Researcher own work, 2016

4.3.2 Regulation and monitoring of hazardous materials transportation

In assessing the current practice of adaptation of international rules and regulations, the next issue will be monitoring and regulating those rules and regulations if they were applied. For this purpose the research address current implementation of both and the monitoring and regulation part were discussed under here.

Table 4.3.2 Regulation and monitoring of hazardous materials transportation

Question Item		Frequency	Percent	N	Mean
Regulation and monitoring of hazardous materials transportation	Strongly Disagree	3	5.6	54	3.94
	Disagree	2	3.7		
	Neutral	14	25.9		
	agree	11	20.4		
	Strongly agree	24	44.4		
	Total	54	100.0		

Source: - Researcher own work, 2016

As it is observed from the result Regulating and monitoring of hazardous materials transportation system in the enterprise is strong, but this was only based on the international rules and regulations without customization and putting additional control. At this point respondent‟s reflection shows mean of 3.94 which is agreed on the existence of monitoring and regulation of hazmat.

4.3.3 Setting additional controls on hazmat cargo transportation system

The finding in the above table 4.4.2 shows the existence of monitoring and regulating hazmat without adaptations of internationals once for local purpose. In this part also the responses for of respondents for setting additional controls on hazardous materials cargo transportation system proves there has been little or no emphasis giving to set additional controls on hazmat during transportation and following events. The score has showed mean of 2.48 based on the responses, which is interpreted as disagreement state on presence setting additional controls on hazardous materials cargo transportation system.

Table 4.3.3 Setting additional controls on hazardous materials cargo transportation system

Question Item		Frequency	Percent	N	Mean
Setting Additional controls on hazardous materials cargo transportation system	Strongly Disagree	9	16.7	54	2.48
	Disagree	24	44.4		
	Neutral	10	18.5		
	agree	8	14.8		
	Strongly agree	3	5.6		
	Total	54	100.0		

Source: - Researcher own work, 2016

4.3.4 Preparation of guidelines for the selection and purchase of new vehicles which are suitable for Hazmat

As part of additional control setting on hazmat cargos, preparing guidelines for the selecting and purchase of new vehicles which are suitable for Hazmat has been assessed. Based on responses gathered view of respondents were observed as agreement with a mean score of 3.28. We can understand from the score procurement process of vehicles for the enterprise transportation service has not been fully considered hazmat cargos.

Table 4.3.4 Preparation of guidelines for the selection and purchase of new vehicles

Question Item		Frequency	Percent	N	Mean
Guidelines for the selection and purchase of new vehicles which are suitable for Hazardous materials	Strongly Disagree	4	7.4	54	3.28
	Disagree	9	16.7		
	Neutral	15	27.8		
	agree	20	37.0		
	Strongly agree	6	11.1		
	Total	54	100.0		

Source: - Researcher own work, 2016

4.3.5 Setting classification and list of products to be considered as hazardous materials during transportation

Mostly, the United Nation classification of hazmat implementation is popular, but usage of the classification maybe missed because of unclear knowledge about the material or lack of awareness is observed on transport service providers. To assess this following question were forwarded to the respondents by requesting them to show there level of agreement. There is clear classification and list of products to be considered as hazardous materials during transportation set by your organization; in reply to this the mean score of 3.89 were observed. This shows there is clear classification of materials to be considered as hazmat during transportation.

Table 4.3.5 Classification and list of products to be considered as hazmat during transportation

Question Item		Frequency	Percent	N	Mean
Classification and list of products to be considered as hazardous materials during transportation	Strongly Disagree	3	5.6	54	3.89
	Disagree	6	11.1		
	Neutral	9	16.7		
	Agree	12	22.2		
	Strongly agree	24	44.4		
	Total	54	100.0		

Source: - Researcher own work, 2016

4.4 Assessment on the current system ability to handle and provide a consistent level of safety and security for hazmat transportation

In this part seven questions were analyzed based on the responses obtained from respondents which are related to transportation system ability to handle and provide consistent, safe and secure hazmat transport service. Each of the questions and their respective mean and frequency score were shown in table 4.4 below; based on that the description of each score also discussed there under.

As per the data‟s analyzed the level of response for availability of an organizational structure for hazmat transport management system (i.e. an organizational charts which clearly showing each transport-related post in an organization); a mean value of 3.31 were scored. According to the result it can be observable there has been not well practice, as the researcher observe during the data collection process there is organizational chart showing each section of the transportation

departments and administrative too. But there is no separate section indicated in the chart for hazmat transportation section, rather it was done by the staffs of the same responsibility for all kind of cargos to be transported by the enterprise. In interview with some functional managers they replied they don‟t believe their organization have implemented hazmat transportation system as per international standard and practice. They even noticed there is no separate hazmat cargo receiving and unloading place in most of the dry ports except Modjo.

ESLSE is has enormous responsibility of rendering sea-transport and logistics services to the country‟s importers, exporters, and investors in a more effective and efficient way, by reducing transit time, cost and handoffs. This question is provided to the respondents in purpose of assessing whether the service rendered by the enterprise is consistent, safe and secured for hazardous materials. Responses shows 3.81 mean score, showing the service is consistence safe and secure; to be more realistic and to reassure the service quality level the next question was forwarded. The efficiency/effectiveness of the loading and unloading procedures enhanced with the appropriate handling devices—trolleys, pallets, and forklifts. In reply to this a mean score of 3.48 were observed, which indicates there is some gap in this area.

Table 4.4 results on assessment of the current transportation system ability

Question Items		Frequency	Percent	N	Mean
Structure for hazmat transport management system	Strongly Disagree	4	7.4	54	3.31
	Disagree	16	29.6		
	Neutral	6	11.1		
	Agree	15	27.8		
	Strongly agree	13	24.1		
Consistency of service rendered by the organization	Disagree	9	16.7	54	3.81
	Neutral	12	22.2		
	Agree	13	24.1		
	Strongly agree	20	37.0		
Efficiency/effectiveness of the loading and unloading procedures	Disagree	7	13.0	54	3.48
	Neutral	24	44.4		
	Agree	13	24.1		
	Strongly agree	10	18.5		
Availability of vehicles to meet the desired delivery schedule	Strongly Disagree	4	7.4	54	2.93
	Disagree	18	33.3		
	Neutral	15	27.8		
	Agree	12	22.2		
	Strongly agree	5	9.3		
Availability of sufficient staff capacity and authority to oversee Hazardous materials transport management	Disagree	13	24.1	54	3.41
	Neutral	16	29.6		
	Agree	15	27.8		
	Strongly agree	10	18.5		
Requirement of basic training for Drivers of hazmat vehicles	Strongly Disagree	14	25.9	54	2.33
	Disagree	22	40.7		
	Neutral	8	14.8		
	Agree	6	11.1		
	Strongly agree	4	7.4		
Examination on basic training course about hazardous materials transportation in a given time	Strongly Disagree	15	27.8	54	2.15
	Disagree	22	40.7		
	Neutral	11	20.4		
	Agree	6	11.1		

Source: - Researcher own work, 2016

To render such a good service availability of materials and labor will play crucial role, in this point the following two questions were forwarded; are there enough functioning vehicles available, with available fuel and drivers, to meet the desired distribution schedule in ESLSE? And availability of sufficient staff capacity and authority to oversee Hazardous materials transport management and to effectively run transport services. In response to this two points a

mean score of 2.93 and 3.41 were recorded respectively. In observing results is it clear there have been problems of having and accessing efficient, modern capacity and advanced vehicles to transport hazmats. In addition to it availability of drivers also has gaps. Some interviewed functional managers has expressed their concern on lack of this capacity as, Even if the startup point is good in separating this places, but there is still a challenge in handling materials and lack off well defined criterion on how to handle those hazmats.

In the next issue as the scored mean shows there is neutral challenge of having availability of sufficient staff capacity and authority to oversee Hazardous materials transport management and to effectively run transport services. But having sufficient facilities and labor doesn‟t always bring efficient and effective service rendering capacity; it needs follow-ups and maintaining gaps. The following section assesses this practice.

In the first place requiring for drivers of hazmat vehicles should to have attended a basic training course may eliminate gaps of knowledge in hazmat handling. To do so there should have to be existing criteria, response show there has been no such practice and that was strengthened by mean score of 2.33. In the other side conducting examination on the corresponding basic training course about hazardous materials transportation in a given time will supposed to close the gap, because it helps to know the problems and upgrade the knowledge of the staffs working in relation with hazmat transportation. But surprisingly the responses has indicated same problematic gap in this section also with mean score of 2.15. Almost all of the interviewed staffs have indicated they haven‟t taken any kind off hazmat related basic or advanced trainings, specifically conducted by their enterprise.

4.5 Current challenges and causes of failure in hazmat cargo handling systems during transportation

To know the situation in ground and have a better understanding of challenges cause failure in hazmat handling and transportation the following questions were forwarded by requesting the respondents to add their own site of challenges. Responses were analyzed as follows for the researcher questions; lack of knowledge in hazmat handling has been observed from mean result of 2.30; lack of appropriate signs, placarded, caution and marking in hazardous material cargos

also been seen by 2.26 mean score and lack of appropriate cargo handling materials has taken status of disagreement as seen in table 4.6.

Table 4.5 Current challenges and causes of failure

Question Items		Frequency	Percent	N	Mean
Lack of knowledge in hazardous material handling	Strongly Disagree	16	29.6	54	2.30
	Disagree	19	35.2		
	Neutral	6	11.1		
	Agree	13	24.1		
Lack of appropriate signs, placarded, caution and marking in hazardous material cargos.	Strongly Disagree	18	33.3	54	2.26
	Disagree	16	29.6		
	Neutral	8	14.8		
	Agree	12	22.2		
	Total	54	100.0		
Lack of appropriate cargo handling materials.	Strongly Disagree	15	27.8	54	2.50
	Disagree	16	29.6		
	Neutral	5	9.3		
	Agree	17	31.5		
	Strongly agree	1	1.9		
	Total	54	100		

Source: - Researcher own work, 2016

In addition, issues like “lack of modern management”, lack of documentation, and implementation of technological instruments were indicated as cause of failure in the enterprise by the respondents. Some of the gaps that can be challenge to the whole system observed confirm there has been lack of available vehicles to meet the desired delivery schedule in great level and the efficiency/effectiveness of loading and unloading procedures have also been disturbed neutrally. During this study the researcher ties to gather data in all possible ways, and in addition to questions informal interview was conducted to assess the challenges. Results of this interviews shows most of the staffs are working with templates prepared by the enterprise to show the classification, other than this awareness creation and basic training has not been conducted. Generally it can be considered as the structure for hazmat transport management system is not well enough as of those international experiences.

CHAPTER FIVE

SUMMARY FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Hazardous materials transportation is more beyond than service rendered by transport companies; is addresses socio-economic system of the country. It involves a number of classified dangerous substances, various modes of transport, moreover number of involved stakeholders and various international and national regulations. In this section to meet the objective of the study conclusion has been made based on the findings stated above and finally recommendations have been made accordingly.

Summary Findings

The study was conducted by having objective of assessing Practice and management of hazardous materials transportation with specifically goals like: - assessing applicability of related international laws or regulations; availability of human resource that are capable of handling hazmat and current challenges and causes of failure in hazmat cargo handling systems during transportation. Further the study has also made assessment on determining whether the current systems are able to handle the adjustments necessary to provide a consistent level of safety and security and evaluate existence of pre capacity assessment of truck and routes to transport hazmat. To do so relevant information‟s were gathered through questioners from targeted groups and the data was analyzed in chapter four. Finally to summarize the study the researcher comes up with major findings discussed under here.

Analysis made to assess applicability of international rules and regulations of hazmat transportation has showed good statues and indicates the enterprise is currently working with international rules and regulations. Literatures and international practices also support working in accordance with international rules and regulations to transport Hazmat without potential damages beside, other needed ways of additional safely measures in transporting methods. To find out the implementations of additional measures assessment were made on how the enterprise transportation service allocation take into account the service delivery priorities to Hazmat and existence of routine analysis to compare actual trips to the scheduled trips, the findings indicate the enterprise has prioritize hazmat cargos more than others but the existence of rout analysis have been in doubt as of the findings.

As the aim of transportation is to move and deliver materials and peoples from place to place without any damage, receiving the right information and instructions from the user and communicating with outsourced parties to get the right service will have great share. Findings indicate presence of problems in level of information exchange with hazardous materials transport service users, which are the base for the enterprise survival and need serious attention. Also level of integration with outsourced hazardous materials transport service providers to deliver the requested service by ESLSE clients has problems. These two issues need critical focus and solutions because of they are interrelated and cause of success and failure for the enterprise.

In ESLSE there have been problems in relation with availability of vehicles to meet the desired delivery schedule, on the other hand availability of sufficient staff capacity and authority to oversee Hazardous materials transport management have been a challenge. Without skilled labor and equipment the service of Transportation Company will fall in risk, taking measures to alleviate challenges were not done yet like setting guidelines for the selection and purchase of new vehicles which are suitable for hazardous materials have also been left over. Coaching staffs and assessing their abilities has been believed to contribute in giving quality service, but requirement of basic training for Drivers of hazmat vehicles and Examination on basic training course about hazardous materials transportation in a given time have huge gaps in the enterprise.

In the assessment made to practice and management of hazardous materials transportation, generally except working with international rule and regulation while shipments are abroad there have been large gaps in monitoring, assessing and handling hazmats. Even though there are proclamations and regulation in the country awareness of the employees and the management observed very low.

Conclusion

Ethiopia as a country had made good progress in making rules and regulation on hazmat transportation controlling by understanding their consequence on the society welfare and economic crises if not properly handled. This study has been conducted with the aim of assessing this Practice and its management in as a whole by making its especial focus on Ethiopian Shipping and Logistics Services Enterprise. All the necessary data‟s gathered for achieving this objective has led to the following conclusions.

As result of globalization International cross boundary hazardous materials transportations have been ruled and directed by number of regulations beginning from national and regional level up to international one, Ethiopia as mentioned early has made local proclamations on shipment and pollutions caused by hazmat. And also adapt international rules and regulations. Despite this ESLSE as one of governmental service rendering enterprise has not made suitable structure to handle hazmat transportation, including not fully equipped with hazmat handling capable vehicles to deliver the cargos up to final destination as per multimodal transportation service. And also the efficiency/effectiveness of loading and unloading procedures has also been disturbed moderately. As well taking measures to alleviate challenges were not done yet like setting Guidelines for the selection and purchase of new vehicles which are suitable for Hazardous materials have also been left over. Generally it can be considered as the structure for hazmat transport management system is not well enough as of those international experiences.

Lack of skilled labor on the other hand make the company to fall in risk, coaching staffs and assessing their abilities has been believed to contribute in giving quality service, but requirement of basic training for Drivers of hazmat vehicles and Examination on basic training course about hazardous materials transportation in a given time have huge gaps in the enterprise.

Practice of planning periodic movement following the customer‟s order and routine analysis to compare actual trips to the scheduled trips, for finding out performance and take corrective measure has been showed the existence of rout analysis have been in doubt as of the findings whereas planning has been done even if it was not as good as expected.

Information and instructions exchange with customers and with outsourced parties indicate presence of problems, which are the base for the enterprise survival and need serious attention. Also level of integration with outsourced hazardous materials transport service providers to deliver the requested service by ESLSE clients has shown problems.

Recommendations

Transportation of hazmat underpins any country economy and our way of everyday life, however, while hazmat plays a critical role in our daily lives, the transportation of hazmat introduces some inherent risks to the public, the environment, and property that need to be appropriately managed. In this section of the thesis, the researcher suggests possible recommendations that will help country‟s hazmat transportation system by alleviating problems that are the research findings. The recommendations are expected to reduce the problems stumble upon the system and to enhance the advantages that should be attained through uprising hazmat transportation practice and its management that can increase organizational performance and ensure a better customer satisfaction.

To solve structural problem faced in ESLSE for hazmat transportation, creating appropriate organizational set up will be the first solution; departmentalization and staffing will make clear the responsibility of each personnel and the specific job to be done by a that department. Responsibilities in linking with receiving of orders with full information of shipment and exchange of data with outsourced firms will then get the right channel, transparency, performance efficiency, and productivity will be ensured if the ESLSE design and implement appropriate structure to hazmat transport.

Creating effective communication system with customers and suppliers should be given priority in doing so; better way of communication with shipment customers and outsourced service providers must have to be done through usage of shipment documents with detailed description, including requiring shippers to provide emergency response information applicable to that specific hazard or hazards of the material being transported. Moreover using packaging marks and labeling, and vehicle placarding are useful to identify hazmat shipments and taking care of them as per their nature. So it will be helpful if ESLSE can implement these measures.

The need for the enterprise's outsourcing and purchasing procedures of hazmat vehicles, its ability to manage internal processes of change, and its relations with other stakeholders and potential partners has to be solved. To do so beyond making structural change there has to adaptation of international practices in this area and customizing them in accordance with the countries status.

In consideration of the challenge of getting readily available professional there will be solution of elevating this challenge through effective training program for existing staffs. Hazmat incidents caused by human error can be reduced through the implementation of an effective training program. Trainings maybe short term, long term or on job training; they are very effective regarding correcting some problems occurred while they are doing their job. A systematic training may include tests and quizzes. This will also be multi purposive solution, another problem and cause of failure was lack of knowledge in hazmat handing via training it will have also get solution. Aids in ensuring safe and secure shipments of hazardous materials Provides employees with understanding of why compliance and safety are necessary.

Making route assessment in comparison with planned trips and keep incidents and accidents happened have to be daily practice of the enterprise. This helps the enterprise to make better route utilization and risk availing mechanism. To do so the enterprise should have to assign researcher groups that are in charge of route assessment and forwarding possible better ways to the management. ESLSE have to implement controlling mechanism while shipments of hazmat are on loading and unloading procedures. Information technology here plays lion share role, using of GIS and other software"s have crucial advantage in controlling shipment locations and also facilitates shipment security.

Arranging separate shipment and receiving place has also to be taking into consideration, this will help the enterprise to reduce risks associate with handling of cargos during unloading which in turn secure safe delivery.

Finally, as part of the process of risk management is to assess the capacities and limitations of the participating and affected organizations and either select strategies that are consonant with the conditions noted or institute a process for reforming the organizational structure and culture. Based on this fact all stakeholders including environmental concerned bodies have to engage

them self in conducting research in this area and setting common policies throughout the country. the researcher recommend other researchers specially those who are participating in policy making to conduct more in depth study on the same or related topic of this study by using more preferably other methods of research.

REFERENCES

ADR, applicable as from 1 January 2011 European Agreement Concerning the International Carriage of Dangerous Goods by Road. (2010). New York: United Nations.

Amalberti, R. (2013). Navigating safety necessary compromises and trade-offs-- theory and practice. Dordrecht: Springer.

Arega Koyehu Kebede, 2015. Rail-road integration for freight transportation along Djibouti corridor

Austria. Department of Resources, Energy and Tourism, (2009). *Leading Practice Sustainable Development Program for the Mining Industry.* Department of Resources, Energy and Tourism.

Baldwin, J. R., & Gu, W. (2003). Export-market participation and productivity performance in Canadian manufacturing. *Canadian Journal of Economics/Revue canadienne d'économique*, *36*(3), 634-657.

Blaeser James, (2011): *Best Practices In International Transportation Management: Taking Visibility Beyond Track & Trace.*

Castillo, J. E. (2004). Route optimization for hazardous materials transport. *International Institute for geo-Information science and earth observation, Enschede, The Netherlands*.

Cloutier, M., & Cushmac, G. (2012). *2012 Emergency Response Guidebook: A Guidebook for First Responders During the Initial Phase of a Dangerous Goods/Hazardous Materials Transportation Incident* (No. PHH50-ERG2012).

Comtois, C., & Slack, B. (2007). *Restructuring the maritime transportation industry: Global overview of sustainable development practices* (No. RTQ-07-01).

Dawson, C. (2002). Practical research methods: A user friendly guide to mastering research. *United Kingdom: HowtoBooks*.

Dimitra Tasoula, I. (2015). *Safety Assessment of Trans-boundary and Multi-modal Hazardous Materials Transportation: Concept Development: The LPG and LNG cases* (Doctoral dissertation, TU Delft, Delft University of Technology).

Emil, C. Methodologies for Performing and Assessing Transportation Management.

Fairfax Lee Highway, & Virginia, (2000): *Risk Management Framework for Hazardous Materials Transportation*

Feyissa, H. G. (2009). *Maritime Law Teaching Material.*

Harris, I., Wang, Y., & Wang, H. (2015). ICT in multimodal transport and technological trends: Unleashing potential for the future. *International Journal of Production Economics*, *159*, 88-103.

https://www.google.com.et/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwihofH8vYvLAhUThhoKHQP_C4gQFggZMAA&url=http%3A%2F%2Fwww.eac.int%2Finfrastructure%2Findex.php%3Foption%3Dcom_docman%26task%3Ddoc_download%26gid%3D104%26Itemid%3D154&usg=AFQjCNGPzI1Qw8P0JuCnWZ4Ci5dqaYPyBQ&cad=rj access date February 22, 2016)

http://www.unece.org/trans/danger/danger.html access date February 20, 2015

Ivankova, N. V., Creswell, J. W., & Stick, S. L. (2006). Using mixed-methods sequential explanatory design: From theory to practice. *Field methods*, *18*(1), 3-20.

JO, Oluwoye. (2007). Transportation of dangerous goods and the environment: *a conceptual framework of the planning for classification procedure of dangerous goods.*

Kahn Ribeiro, S., Kobayashi, S., Beuthe, M., Gasca, J., Greene, D., Lee, D. S., & Wit, R. (2007). Transport and its infrastructure. *Climate change*, 323-385.

Kawprasert, A., & Barkan, C. (2008). Effects of Route Rationalization on Hazardous Materials Transportation Risk. *Transportation Research Record: Journal of the Transportation Research Board*, (2043), 65-72.

KhorasaniGholamreza, TatariAshkan, Yadollahi Ali & RahimiMilad, (2013): *International Journal of Chemical, Environmental & Biological Sciences (IJCEBS) Volume 1, Issue 1 (2013) Evaluation of Intelligent Transport System in Road Safety.*

Luceri, C., Carosso, G., & Oreste, P. (2012). The International Multimodal Transport of Hazardous Goods and Waste. *American Journal of Agricultural and Biological Science*.

Mahaboon, J., Grzebieta, R. H., Friswell, R., & Mooren, L. (2012, August). Fleet Safety Management Practices in Hazmat Transportation: Challenges in Thailand. In *Australasian College of Road Safety Conference 2012, Sydney, New South Wales, Australia*.

National Academy of Sciences, 2013

National Research Council (US). Transportation Research Board. Committee for a Study of the Feasibility of a Hazardous Materials Transportation Cooperative Research Program. (2005). *Cooperative Research for Hazardous Materials Transportation: Defining the Need, Converging on Solutions* (No. 283). Transportation Research Board.

New York and New Jersey. Port Authority Police Department. (2009). *Hazardous Materials Management* manual. Port Authority Police Department.

Njord John R. & Meyer Michael D. (2005): *Critical Issues in Transportation*

Rahman, A., Fiondella, L., & Lownes, N. E. (2014). A Bi-Objective Approach to Evaluate Highway Routing and Regulatory Strategies for Hazardous Materials Transportation. In *Journal of the Transportation Research Forum*(Vol. 53, No. 1, pp. 7-22). Transportation Research Forum.

Rondinelli, D. A., & Berry, M. A. (2000). Corporate environmental management and public policy bridging the gap. *American Behavioral Scientist*, *44*(2), 168-187.

Rydzkowski, W. (2005). Infrastruktura transportu kolejowego. Red. Rydzowski W., WojewódzkaKról K., Wydawnictwo Naukowe PWN, pp. 298-302.

Spraggins, H. B. (2007). The case for rail transportation of hazardous materials. *Journal of Management and Marketing Research*,

State of Nevada. Department of Motor Vehicles. (2012). *Commercial Driver's License Hazardous Materials Handbook*. Department of Motor Vehicles.

Tseng, Y. Y., Yue, W. L., & Taylor, M. A. (2005). The role of transportation in logistics chain. Eastern Asia Society for Transportation Studies.

Protopapas, A. A., Jasek, D. L., & Morgan, C. A. (2009). *Public Guidance for Managing Hazardous Material Transportation in Texas* (No. FHWA/TX-09/0-5929-P1). Texas Transportation Institute, Texas A & M University System.

Visual Risk Technologies, Inc, et al. *Hazardous Materials Transportation Risk Assessment: State of the Practice*. Vol. 12. Transportation Research Board, 2013.

WESTERN, J. L., & RAN, B. (2000). Information Technology in Transportation Key Issues and a Look Forward. *Transportation in the New Millennium*.

Annex I Questionnaire

ADDIS ABABA UNIVERSITY
SCHOOL OF COMMERCE

Dear respondent,

First I want to forward my gratitude for your time in responding to the research questionnaire provided below. I‟m a postgraduate student at Addis Ababa university school of commerce, department of logistics and supply chain management. This questionnaire intends to collect data in partial fulfilment of the requirement for the award of MA Degree in Logistics and Supply Chain Management, for this thesis entitled "Study on Practice and management of hazardous materials transportation in Ethiopia".

You have been selected as one of the respondents and you are kindly requested to fill this questionnaire candidly. It is important that all information requested in the questionnaire should be provided as completely and accurately as possible to fulfil the objectives of the study.I thank you in advance for your time and cooperation in completing the questionnaire.

Please note that information given here will be held with strict confidentiality and will be used only for research purposes.

Instruction: Please put "√" ***inside*** the boxes as appropriate.

SECTION I: General Information

1. Gender
   a) Male ☐ b) Female ☐
2. Qualification:

Certificate ☐ Diploma ☐ First degree ☐ Masters ☐
PhD ☐

3. Year of experience

1-5 ☐ 6-10 ☐ 11-15 ☐ 16-above ☐

SECTION II: *The following statements related to Assessment on Practice and management of hazardous materials transportation.*

Please indicate the degree to which you agree to the Practice and management of hazardous materials transportation in your organization by putting**"√"** inside the boxes as appropriate.

(**1**=Strongly Disagree, **2**=Disagree, **3**=Neutral, **4**= agree **5**=Strongly agree)

No.	**Questions related to Practice and management of hazardous materials transportation.**	**5**	**4**	**3**	**2**	**1**
1	Your organization has applies international rules& regulations of hazardous materials transportation and regulations.					
2	Your organization has evaluation mechanisms set for hazardous materials transportation management.					
3	Transportation allocation taking into account the service delivery priorities to Hazardous material.					
4	There is a routine analysis to compare actual trips to the scheduled trips.					
5	There is a period movement plan/schedule for each hazardous material transportation requirement.					
	Practice of insuring hazmat transportation with necessary actions					
6	Your organization require certificate of approval for each transport unit or element.					
7	Means of identification, which include a photograph, for each member of the vehicle crew, is checked.					
8	Hazardous materials shall be placarded and marked in conformity with international standards to be shipped by Your organization.					
9	There is a high level of integration with hazardous materials transport service providers which are outsourced.					
10	There is a high level of information exchange with hazardous materials transport service users.					
	Adaptation and customization of International rules & regulation and their implementation					
11	International rules & regulation has been adapted and customized.					
12	Your organization regulates and monitors hazardous materials transportation given by it.					
13	Additional controls on hazardous materials cargo transportation					

	system have been set by your organization.					
14	Guidelines are in place for the selection and purchase of new vehicles which are suitable for Hazardous materials.					
15	There is clear classification and list of products to be considered as hazardous materials during transportation.					
	Assessment on the current system ability to handle and provide a consistent level of safety and security for hazmat transportation					
16	There is an organizational structure for the transport management system (an organizational chart clearly showing each transport-related post in an organization).					
17	The service rendered by your organization is consistent, safe and secured transportation service for hazardous materials.					
18	The efficiency/effectiveness of the loading and unloading procedures enhanced with the appropriate handling devices—trolleys, pallets, and forklifts.					
19	There are enough functioning vehicles available, with available fuel and drivers, to meet the desired delivery schedule in your company.					
20	There is sufficient staff capacity and authority to oversee Hazardous materials transport management and to effectively run transport services.					
21	Your organization has requirements for Drivers of dangerous goods vehicles should attend a basic training course.					
22	Examination has been held on the corresponding basic training course about hazardous materials transportation in a given time.					
	Concerning Causes of failure in hazmat cargo handling systems during transportation	**5**	**4**	**3**	**2**	**1**
23	Lack of knowledge in hazardous material handling					
24	Lack of appropriate signs, placarded, caution and marking in hazardous material cargos.					
25	Lack of appropriate cargo handling materials.					
	Other please specify here:-					

Please describe if you have further idea about hazardous material transportation system in your organization here:-

Interview with transportation department managers

1. Does any law or regulation exist to control hazmat transportation in you enterprise?
2. Did your organization done any and routs assessment?
3. Did the organizational structure suitable to hazmat transportation?
4. Is their timely managed and based on need assessment training in the enterprise?
5. What are the current challenges in hazmat transportation cargo handling systems, if any?
6. Does your organization regulate and monitor hazardous materials transportation?