ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

The impact of empty running trucks on economy and environment:

(A case study on the Addis Ababa- Djibouti Corridor)

A Thesis submitted to

The School of Civil and Environmental Engineering

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M.Sc. Thesis on

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DECLARATION

I certify that this research work titled the impact of empty running trucks on economy and environment, (A Case Study on the Addis Ababa- Djibouti corridor) is my own work. The work has not been presented elsewhere for assessment and award of any degree or diploma. Where a material has been used from other sources, it has been properly acknowledged/ referred.

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Name Signature Date

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Abstract

Road transport is the backbone of the real economy but its future health depends on providing better environmental and economic benefits, not simply more transport. And hence it calls for an efficient transport to improve the economic growth that takes into account the emissions that drives climate change.

Vehicle utilization level is a measure of how efficiently the freight sector is transporting goods. When transporters cannot arrange for a return shipment, the empty truck move doesn't generate revenue, but accumulates costs in labor, equipment wear, and fuel and produce hazardous emissions. Currently, in Ethiopia, the gap in trade balance is very wide resulting in poor vehicle utilization level (for transport between the capital city and port), transparency is lacking and responsibilities are fragmented, and hence that the current road freight transport system is not taking advantage of its large scale.

The main objective of this research was focused on providing a better understanding of goods transport along Addis Ababa – Djibouti corridor and describing the impact of vehicle utilization level inefficiency on the environment with respect to CO_2 emission and on the economy of the country in terms of vehicle operating costs and loss of foreign currency in Ethiopia.

A combination of both quantitative and qualitative research methods were employed in this study. To reflect on the efficiency performance of the freight transport in Ethiopia particularly along Addis Ababa – Djibouti corridor, the goods flow, different stakeholders and constraints were mapped out and discussed based on the literature review and the interviews. Secondary data was collected from the different stakeholders and was analyzed using formulas from literature reviews to assess the load factor and empty running rates along Addis Ababa – Djibouti corridor. CO_2 emission, truck operating costs, trade balance deficit and the loss in foreign currency due to the empty running trucks was also estimated.

The study showed that the trade balance deficit is found to be the main transport inefficiency factor amounting to 90% trade imbalance, The rate of empty running which mainly results from the trade balance deficit is estimated to be 46% and the country is losing around 300 million dollars of foreign currency per year accompanied by a 200,000tons of unnecessary CO_2 emission per year. This paper does not attempt to suggest that partly loaded or empty running trucks can be fully eliminated; however there is a room for improving the economic sector of the country by increasing export volume while sustaining the same CO_2 emission level

if not decreasing the disadvantage that the emission contributes to the environment.

Keywords: Road freight transport, empty running trucks, back-loading, trade balance deficit, efficiency

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Abbreviations

AACC – Addis Ababa chamber of commerce & Sectoral Associations
CAP – capacity
COMESA – Common Market for East and South Africa
CSA – Central Statistics Agency
ECA – Economic Commission for Africa
ECA – Ethiopian Customs Authority
EFTC – Ethiopian Freight Transport Corporation
EPTC – Ethiopian Public Transport Corporation
ERA – Ethiopian Road Agency
ERCA – Ethiopian Revenue and Customs Authority
ER – Empty Running Rate
FDRE – Federal Democratic Republic of Ethiopia
GDP – Gross Domestic Product
HGV – Heavy goods vehicle (also referred to as "truck" and "freight vehicle")
ICT – Information and communications technology
JIT – Just-in-time deliveries
LF – Load Factor
MTSE – Maritime and Transit Services Enterprise
MOFED – Ministry of Finance and Economic Development
MOI – Ministry of Infrastructure
NBE – National Bank of Ethiopia
PDRE – Peoples Democratic Republic of Ethiopia
RRA – Regional road Authority
RSDP – Road Sector Development Program
RTA – Road Transport Agency
RTCB – Road Transport and Communication Bureau
SADC – Southern Africa Development community
SIDA – Swedish International Development Agency
SNNPR – Southern Nations Nationalities and Peoples Region
SSATP – Sub Saharan Africa Transport Program
UNECA – United Nations Economic Commission for Africa
UK – United Kingdom
USAID – United States Aid for International Development
WB – World Bank
WBI – World Bank Institute
TEU/FEU Twenty/Forty Feet Equivalent Unit

1 Introduction

1.1 Background

Road freight transport is crucial to a country's economy linking supply to demand and many sectors. As the mode of transport that brings most goods to their final destination, it is essential for the well-being of any economy, and it is a major indicator of economic strength generating a significant portion of GDP, employing millions of people, and offering the primary means for moving domestic, trans-border, and international cargo. As has been said, to know where the economy is going you have to follow the truck (Heinrich, B., 2009)

Freight transportation is one of today's most important activities, with the increasing influence that transportation and distribution of goods have on the performance of all other economic sectors (Crainic and Laporte, 1997).

At the same time, transport also has several negative impacts attached to it. Some of which are environmental impacts, such as emissions that contribute to climate change, noise disturbances, traffic accidents and so on. These factors make that there is an increasing interest in investigating the constraints towards achieving an efficient freight transport.

To be able to identify the gap, an in-depth study of today's transport efficiency is required. This thesis aims at gaining insight in the relevant characteristics of transportation efficiency parameters such as load factor and empty running rates to be used as a platform for improvements.

Vehicle utilization level is a measure of how efficiently the freight sector is transporting goods. When transporters cannot arrange for a return shipment, the empty truck move doesn't generate revenue, but accumulates costs in labor, equipment wear, and fuel. (European environmental agency, Term 030)

If vehicle utilization level could be improved, through reduced empty running and making better use of each vehicle's carrying capacity then the truck operating costs would be generating revenues instead of being just a loss.

In Ethiopia, The road freight transport service constitutes more than 90 percent of the total tons covered by all modes of transport. (Asnake T., 2006). In this regard, efficient road transport system would benefit the country tremendously.

To achieve this, it calls for a better understanding on what the current freight transport system looks like, what the saving opportunities could be, and what the impact of logistical constraints is on the savings potential of the road transport.

Figure 1: Transport along Addis Ababa - Djibouti corridor

Since the independence of Eritrea, Ethiopia became a land locked country and access to sea ports became a major constraint for its foreign trade. Historically, Djibouti was the gateway port to Ethiopia, with most of the traffic moving by rail. In the late 1970s Ethiopia developed the port of Assab which handled the major part of Ethiopia's foreign trade. In 1994/95, Ethiopia had access to two ocean ports. Assab handled 73 percent of imports and 51.7 percent of exports, while Djibouti 0.8 percent of imports and 3.2 percent of exports. The total volume of imports was 1,690.516 million tons while export was 253.167 thousand tons a ratio of almost 7:1between imports and exports. Even prior to 1994/95, the international trade through Assab was significantly high with the share of Djibouti not more than one percent (Asnake,T.,2006).

Nowadays, Djibouti is the main port responsible for the movement of imports and exports in the country. This marks the Addis Ababa – Djibouti Corridor the prime corridor where the country depends upon for its economic growth. Therefore, this paper focuses on the impact of the inefficiency of transport along Addis Ababa – Djibouti corridor. Figure .1shows typical transport along Addis Ababa – Djibouti corridor

1.2 Problem statement

Different factors such as trade balance deficit and inefficiencies in freight operations can cause trucks to travel empty or partly loaded or idle unnecessarily. These inefficiencies increase fuel consumption and truck operating costs. As a result of this economic and environmental consequences are faced.

The economic and environmental impacts fall on the different stakeholders involved in the transport sector. Transport companies miss opportunities to generate revenue; there would be an increase in cost for the user and the country also losses foreign currency without generating revenue. Environmental impacts such as CO_2 emissions, noise disturbances are consequences of road transport. This impact is exaggerated due to the inefficiency of transport.

The key issue to explore in the study to what extent is the Addis Ababa Djibouti facing the inefficiency of transport is to reach the goal, it was necessary to formulate research questions that address concrete research areas, which is:
How is the goods transport along Addis Djibouti route organized, and what are applicable options to be introduced in order to improve the goods transport in gaining benefits in terms environment and economy?

This main research question could be divided in the following sub research questions:

1: How is the goods transport along Addis Ababa –Djibouti route currently organized and what is the desired situation?

2: Which constraints need to be considered to improve the goods transport service along the route?

3: What measures could be taken to reduce or avoid empty running along the route?

4: How these measures impact the environmental and economic aspects of the country and how could this impact be measured?

1.3 Research scope and limitations

National commodity movements considered in this study were limited to import and export.

It was very difficult to collect secondary data from the different transport companies due to the confidentiality of data. Hence, most of the data for this study was collected from government institutions such as Maritime Authority, (Ethiopia Revenue and Customs Authority (ERCA), National bank of Ethiopia (NBE), Ethiopian Roads Authority (ERA) etc.

To analyze the data many assumptions were made based on literature reviews and interviews due to lack of data and the specifics of which could be found in the methods and results section.

The estimation of load factor is done by using weight (tonnage) data. Volumetric data for loading of trucks could not be found where the detailed description is given on the literature and methods section of this paper.

2 Literature review

The literature review covers the most significant parts of the subject, and is intended to serve as an introductory input to the subsequent analysis stages of the project, by seeking to improve the knowledge about the inefficiency of the freight road transport in Ethiopia with special emphasis along Addis Djibouti corridor and its contributing factors. Although, it was not possible to find direct researches conducted in Ethiopia on the subject area, a number of related studies have been covered. Studies made in other parts of the world were reviewed to interpret and utilize the information obtained in the context of the situation in Ethiopia.

2.1 Logistics

Logistics is the management of the flow of goods from point of origin to destination which integrates transport, warehousing, packaging, inventory and material handling and is also part of the supply chain that adds the value of time and place utility as noted in Wikipedia. It aims at improving companies' efficiency and economic performance (Vendela, S., 2013). Inefficient logistic services tend to impose an extra cost in terms of time and money and as a result impede trade. (Jane, K. and Sourdin, P., 2011. Logistic services are composed of physical activities such as transport and storage and non - physical activities. (Yungu-u, T. et al, 2005)

Transport being a component of logistics, its inefficiency has an impact in the economy hence it calls for an in-depth study of today's transport efficiency.

2.2 Logistic costs and gross domestic product

The increase in total logistics costs has been slower than the increase in GDP for the last two decades, resulting in a considerable reduction of about 30 percent in the participation of logistics costs in GDP. In 1992, the participation of logistics costs in GDP was estimated at 10.1 percent in Japan, 12.2 percent in Europe, and 13 percent in newly industrialized Pacific Rim countries (World Bank and DFID, 2009).

Transport has a direct impact on logistics cost which can affect a national economy (Techane, B. 2013). It has been said that "To know where the economy is going, follow that truck" (World Bank & DFID, 2009) and it is also transport is the fastest growing source of greenhouse gas (GHG) emissions. (Jachim, M. (2011)

Increased productivity means that fewer resources are used to do the same work and hence the connection between productivity and profitability is strong. (Lumsden 1998). And hence transport cost has a direct effect on the economy contributing to GDP.

2.3 Road freight transport and its effectiveness

Freight transport is an important activity that connects demand and supply. The profitability of individual transportation firms depends on efficient operations.

According to (Niklas, A. 2011) transport efficiency is defined as "a set of utilization measures of time, space, vehicle, fuel and driver in the movement of goods". And hence in this study the word efficiency refers to the vehicle utilization effectiveness in terms of empty running trucks, vehicle loading and fuel usage.

Shifting as much of the freight transport to more energy-efficient transport modes such as rail or sea was usually considered the most efficient way but a strong case for road freight usage remains since it provides the rapid services needed over shorter distances and can accommodate for short-term demand fluctuations to a much better extent than other freight modes. (Groothedde,et al. 2005).

According to (Fredrik and Eva, 2013)eliminating empty runs and consolidating different shipments to maximize vehicle fill rates means that the benefits of road freight movements are better balanced against the negative externalities impossible to eliminate of this transportation.

Many factors affect vehicle running costs including, back-haul possibilities, empty running and idle time, restrictions on working hours, road conditions such as deteriorated pavement and traffic congestion, law enforcement procedures along the road and at border posts, standard of trucks, fuel consumption, labor prices, vehicles and its spare parts, availability of freight forwarding services, policies and other quality management services. (http://www.worldbank.org/transport/roads/rdt_docs/annex1.pdf)

According to World Bank (http://www.worldbank.org/transport/roads/rdt_docs/annex1.pdf), the three main elements that form the costs for transport were fuel, wages, and capital. For operations in low- and medium-income countries operations the typical proportion of operating costs found for each item was estimated below.

One of the measures of performance is truck operating costs. Table 1 was used as an input to estimate the truck operating cost.

Table 1 Proportion of truck operating cost
(http://www.worldbank.org/transport/roads/rdt_docs/annex1.pdf)

Cost Item	Proportion of Operating Cost (%)
Variable Costs	
Fuel	20 – 30
Lubricating Oil	1 – 5
Tires	10 – 15
Spares	15 – 20
Fixed Costs	
Driver and other cab staff	10 – 20
Other Labor	About 5
Depreciation and Interest	15 – 20
Overheads and other costs	10 – 15
TOTAL	100

2.4 Backhauling

According to (Ljungberg, D. 2006) back- hauling is the utilization of loading capacity on empty return legs.

Transportation highly depends on how many kilometers a truck operates empty or partly full, as cost per kilometer of operating a truck depends on the quantity of goods in the truck (Jordan & Burns 1984). Both the carrier and the shipper must have an economic incentive to carry through with the backhaul. It can, for example, be to cut cost per kilometer or increase revenues.(Fredrik and Eva, 2013). Backhauling is important for the economy.

2.5 Trade balance deficit

Daniel (2011) noted that:
"Exports are good, imports are bad- Exports create jobs, while imports subtract from output and employment"

According to (Olaf, J., Erhan, D., Jos, V. and Piet R. 2008), imbalances are caused by regional differences in demand and supply for transport. For example, in Europe, most seaports, such as Rotterdam and Hamburg, are import ports of, in particular, bulk goods such as oil, coal, etc. This implies that more cargo is transported from the seaports to the hinterland than in the opposite direction, which causes an imbalance in trade flows

At the route level, imbalance is measured bilaterally; so on every route the imbalance is measured by the ratio of the number of trips in one direction to the number of trips in the opposite direction Olaf et al (2008). And hence this idea was used as an input to estimate the trade balance deficit in this study.

2.6 Vehicle load factor

Throughout the years, different types of approaches were followed to define load factor. The load factor is often defined as the number of ton-km divided by the number of vehicle km
(Nadine N., Jean-Luc M. et al. 2004) defined the load factor as

"*the ratio of the average load to total freight capacity in tones. A difference should be made between load factor for loaded trips (excluding empty running) and load factor for all trips (including empty running)".*

(Transport Research Arena-Europe, 2012) determined the load factor as a percentage of capacity in tones, on a loaded trip j, for a freight vehicle, the load factor is the ratio of the load (TON) to total vehicle capacity (CAP). On a given period of the average load is weighted by the loaded distances: the load factor (LF), expressed as a percentage of CAP. This was used as an input to calculate the load factor in this study.
UK statistics showed that load factors (excluding empty running) remained fairly stable at around 63 % between 1986 and 1996.In Denmark, load factors for loaded trips fell from over 70 % in 1984 to 47 % in 1996, and for all trips (including empty running) from 45 % to 38 %. (Transport Research Arena-Europe, (2012). Accordingly these umbers were used for comparison with the estimated load factors in this study.
In USA a declining load factor was recorded at least in the 1980s (Sustainable Transportation Monitor, 2001).
Average load factor of 60% for comet transport was reported by (The Addis Ababa Chamber of Commerce and Sartorial Associations and SIDA 2009)
On this study the load factor for loaded trips is calculated excluding empty running.

2.7 Empty running rate

The rate of empty running vehicles is often defined as the rate of vehicle-kilometers without goods or passengers.
The rate of empty running mainly results from trade balance deficit. When the flow of goods imported don't balance with the flow of goods exported, trucks would be forced to run empty in the direction of lower flow of goods.

According to Euro stat in 2006, trucks run empty for 13%of the distance travelled in Latvia and 17% in Denmark, while this proportion seems to be much higher in Greece (35%) and in islands (38% in Ireland and up to 45% in Cyprus).(Transport Research Arena-Europe, 2012). This numbers were used for comparison of the empty running rates estimated in this study.

It is impossible to eliminate empty running vehicles because there are commodities that need special kind of trucks such as fuel.
According to (Transport Research Arena-Europe, 2012), empty running is the proportion of kilometers which are run empty.

2.8 Load and fuel intensity

It was noted that the loading factor, or average load weighted by the distances, is the result of vehicle capacity, load rate for loaded trips and empty running.

For freight, the maximum load is calculated as the difference between maximum authorized vehicle weight and the weight of empty vehicle. The maximum authorized vehicle was reported to be 40ton in many European countries, with a maximum capacity around 25 t. per Heavy Duty Vehicle. In the UK, this maximum weight has grown from 32 to 38 t. in 1983 and progressively up to 44 t. in 2001 (McKinnon, 2005);

The permissible axle load limit in Ethiopia was found to be58MT (Biniam T. 2014).The average pay load was reported to be 30 for comet transport (The Addis Ababa Chamber of Commerce and Sartorial Associations and SIDA, 2009)

2.9 Environmental consequence-CO_2 emission

One of the major current issues on our planet is the impact of Carbon Dioxide (CO_2) emissions. It was globally acknowledged that the cause of climate change is mainly due to human activities and agrees that strict measures have to be implemented promptly. According to Jean, L., Jacques L. et al (2010) "global warming caused by CO_2 seems to be the most visible-even if not the most costly – problem of a non-sustainable transport system"

The majority of greenhouse gas emissions from transportation are CO_2 emissions resulting from the combustion of petroleum-based products, like gasoline, in internal combustion engines.
Carbon footprint was defined by a measure of the amount of carbon dioxide emitted through the combustion of fossil fuels. In the case of a business organization, it is the amount of CO_2 emitted either directly or indirectly as a result of its everyday operations. (Wiedmann, T. and Minx, J. 2008)

According to guidelines for measuring and Managing CO_2 Emission from freight transport operations there are two ways to estimate CO_2 emissions. These are energy and activity based approaches. Due to the fact that almost all CO_2emissions from freight transport are energy-related, the simplest way of calculating these emissions is to record energy use and employ standard emission factors to convert energy values into CO_2.The activity based approach is to be used in absence of energy data (Responsible Care, ECTA and cefic, 2011).

Hence, the formulas as per (Responsible Care, ECTA and cefic, 2011) for estimating CO_2 emissions were found to be

CO_2 emissions = fuel consumption x fuel emission conversion factor

[Tons CO_2 emissions = liters x kg CO_2 per liter fuel / 1.000]

The fuel emission factors in Table 2 were used to estimate the CO2 emissions in this study

Table 2: Fuel emission conversion factors (Responsible Care, ECTA and cefic, 2011)

Fuel type	**kg CO_2/liter**	**kg CO_2/kg**
Motor Gasoline	2.8	
Diesel Oil	2.9	
Gas Oil	2.9	
Liquefied Petroleum Gas(LPG)	1.9	
Compressed Natural Gas (CNG)		3.3
Jet Kerosene		3.5
Residual Fuel Oil		3.5
Biogasoline	1.8	
Biodiesel	1.9	

2.10 Past studies related to Ethiopia

World Bank (2013) reported that the road freight transport service constituted more than 90 percent of the total tons covered by all modes of transport. In 2011 typical daily truck traffic from Djibouti port to Ethiopia was about 1,200 loaded trucks where about 200 carried oil, another 20%-30% carried containers and cars, while the remainder carried goods imported in bulk.

According to (Asnake, 2006) the pattern of traffic showed that long distance goods traffic predominates over major part of Addis Ababa- Djibouti road and indicated that over 90 percent of all traffic is cleared at Addis Ababa and raised fees for storage in or near the port, was causing importers to transport containers all the way to Addis or to a dry port at Modjo, 60 km short of Addis Ababa. Fig 2 shows a sample picture of Modjo dry port.

Table 3: Imports by clearing stations (petroleum not included) (2004/05) (Asnake T. 2006)

Location	***Addis Ababa***	***Nazareth***	***DireDawa***	***North***	***Total***
Volume in Tons	*1,871,183*	*41892.2*	*63835.7*	*17953.7*	*1,994,865*
%	*93.8*	*2.1*	*3.2*	*0.9*	*100*

The above table (Table 3) indicates that almost all the traffic along Addis Ababa – Djibouti route corridor travels all the way between Addis Ababa and Djibouti.

Figure 2: Modjo dry port

Truck operating costs

According to (Addis Ababa Chamber of Commerce & Sectorial Associations and SIDA, 2009) transport companies charge tariffs of about 3 cents per ton-km, which is exceptionally low by international standards, despite the fact that almost all trucks have to return empty because of the severe imbalance between imports and exports (imports have therefore to bear the full cost of the round trip.

Vehicle Capacity and Traffic

In 2004, the whole 925-km route from Addis Ababa to Galifi accounted for 18 percent of truck movement over the surveyed network, for 47 percent of truck-trailer movement, and for 25 percent of total movement by all trucks. It is expected that this proportion will have increased in 2008, when much higher import and export volumes (c. 8.5 MT) were transported (up for 6.5 MT, in 2005). (Addis Ababa Chamber of Commerce & Sectorial Associations and SIDA, 2009)

CO_2 emission

According to (Robel M., 2013), road transport accounts for 70% of BAU emission in Ethiopia and the government of Ethiopia (FDRE) has initiated the climate resilient and Green Economy initiative to protect the country from adverse effects of climate change and build a green economy that will help realize the ambition of reaching middle – income status by 2025.

Ethiopia Carbon dioxide (CO_2) emissions from transportation: The International Energy Agency provided the average value for Ethiopia during 1971 to 2011 was 1.23 million metric tons with a minimum of 0.51 million metric tons in 1972 and a maximum of 2.87 million metric tons in 2011. (The Global Economy.com)

Load factor

The Load factor found for Ethiopia from previous studies was 60% (2006) (AACCSA and SIDA, May 2009)

Stakeholders

Stakeholders are people and organizations that have a direct interest in or are affected by a project. Hence this section will map out and discuss their responsibility in freight transport sector and share of contribution towards the efficiency of the freight transport based on literature reviews and the interviews carried out.

The Ethiopian Revenues and Customs Authority (ERCA): the body responsible for collecting revenue from customs duties and domestic taxes. Every import or export goods and their documents must be processed through this office.

Inefficient procedures were witnessed by customers that lead to delay at exit or entry points of the customs Authority. As a result, importers or exporters viewed the customs procedure as a weakness that blocked the movement of international trade. As has been gathered from the interviews, Transport companies do not usually find export goods to transport to Djibouti but even when they do they choose to ignore it and go empty to bring import products since the time to process the documents takes days they can't afford to lose.

On the other hand, of all the stakeholders, the Ethiopian Revenues and Customs Authority (ERCA) had a better database of import export movements compared to the other stakeholders.

Freight Forwarders are the responsible for organizing the transport. They work as a mediator between import export companies and transporters. Freight forwarders that work in the international cross borders take care of custom processes and other related documentation.

According to (Fekadu D. 2013) there were about 53 licensed freight forwarding firms and 21 Goods-Transit and shipping agents which are small in size and capacity and biggest publicly owned forwarding company Maritime and Transit Services Enterprise (MTSE) which provides the bulk of freight forwarding, shipping agency and stevedoring service in the port of Djibouti.

These companies normally work without any support of any information technology and hence they provide limited services.

Transport authority: is the organization with prime responsibility for control and regulation of road transport.

Transport service providers: are companies that own and manage the trucks. The existing forms of organizations include, Private Limited Companies, Share Companies**,** Publicly owned enterprises, and Associations.

The transport companies were divided into three categories as per the new reform. They are termed as: level 1, level 2 and level 3. The companies with larger fleets and newer trucks were classified under level 1 and the list goes down respectively. The total number of trucks registered with the Transport Authority in 2007 EC as per the new reform by transport authority was 9,362. The data for the currently licensed companies as per the new reform is attached in Annex 1.

From the data, the top 10 transport companies as per their total fleet were filtered and tabulated with their age and carrying capacity in descending order.

Table 4: major transport companies in Ethiopia with their corresponding carrying capacity and age of trucks

No	Company name	Organization	<=10		10.1 - 20		>20		Age	Total
			30-40	20-29.9	30-40	20-29.9	30-40	20-29.9	20-40	
1	Trans Ethiopia PLC (cross border)	Company	404		19					423
2	Tikur Abay PLC (cross border)	Company	175		107					282
3	Akida PLC (Cross Border)	Company	270							270
4	Commet Transport Share Company (Cross border)	Company	121				112			233
5	Medihin Ass.(cross border)	Association	223							223
6	Continental Ass. (cross border)	Association	223							223
7	Welel cross border freight transport	Association	208							208
8	Derba MIDROC PLC cross border	Company	144					64		208
9	Bekelcha Transport Share Company	Association	143		15		31			189
10	Tsehay Cross border Freight Transport Ass.	Association	174							174

9% of the above companies own trucks with carrying capacity of 20 to 30 tons and also 6% of the age of the above companies are between 20 and 30 years 9%> 20 years and the rest 85% were found to have the age of less than 10 years.

From the interview and literatures, major government related, such as comet, transport companies were estimated to be about one half of the total fleet that operates on the Addis Ababa - Djibouti corridor. The large private transport companies generate the majority of their revenue along the Addis Ababa - Djibouti corridor.

The above companies being the major stakeholders in relation to this study there are also other stakeholders that have direct interest such as Maritime Affairs authority, Ministry of trade and investment, Ethiopian roads authority and National bank of Ethiopia, Ministry of finance and economic development (MOFED) and the like

3 Objective

Based on the literatures in the previous section, there was a need to create a better understanding on what the current freight transport system looks like, what the losses due to inefficiency of the transport, and what the impact of logistical constraints is on the savings potential of the corridor. Therefore, the goal of this thesis was to identify the factors that lead to a reduced load factor for the current status of logistics practice in Ethiopia with the aim of identifying the gaps, potentials and constraints for the development of effective and efficient logistics systems.

The main objective of this research was to provide a better understanding of goods transport along Addis Ababa – Djibouti corridor and describing the impact of poor vehicle utilization on the environment with respect to CO_2 emission and on the economy of the country in relation to vehicle operating costs and loss of foreign currency in Ethiopia.

The specific objectives were to:

1. map out the good flows from Addis Ababa to Djibouti and from Djibouti to Addis Ababa
2. identify the constraints behind the inefficiency of Addis Ababa-Djibouti corridor
3. determine the load factor , and Empty running rates
4. Estimate truck operating costs and the resulting foreign currency loss along Addis Ababa – Djibouti corridor due to empty running trucks to show how the inefficiency is affecting the economy of the country
5. quantify the CO_2 emission due to empty running trucks to show how the inefficiency is affecting the environment

4 Methodology

4.1 Study area

The study focuses on Addis Ababa – Djibouti corridor connecting Addis Ababa and Djibouti. It is the major corridor that handles the movement of the import and export trade. Addis Ababa is the national capital of Ethiopia and is located about 2,500 m (8,200 ft) above sea level with at 9°1′48″N38°44′24″Ecoordinates: Djibouti port (city) is the capital and largest city of Djibouti in the horn of Africa. Two thirds of the country's population lives in the town.

Figure 2 shows the road network of Ethiopia, indicating the Addis Djibouti road in particular

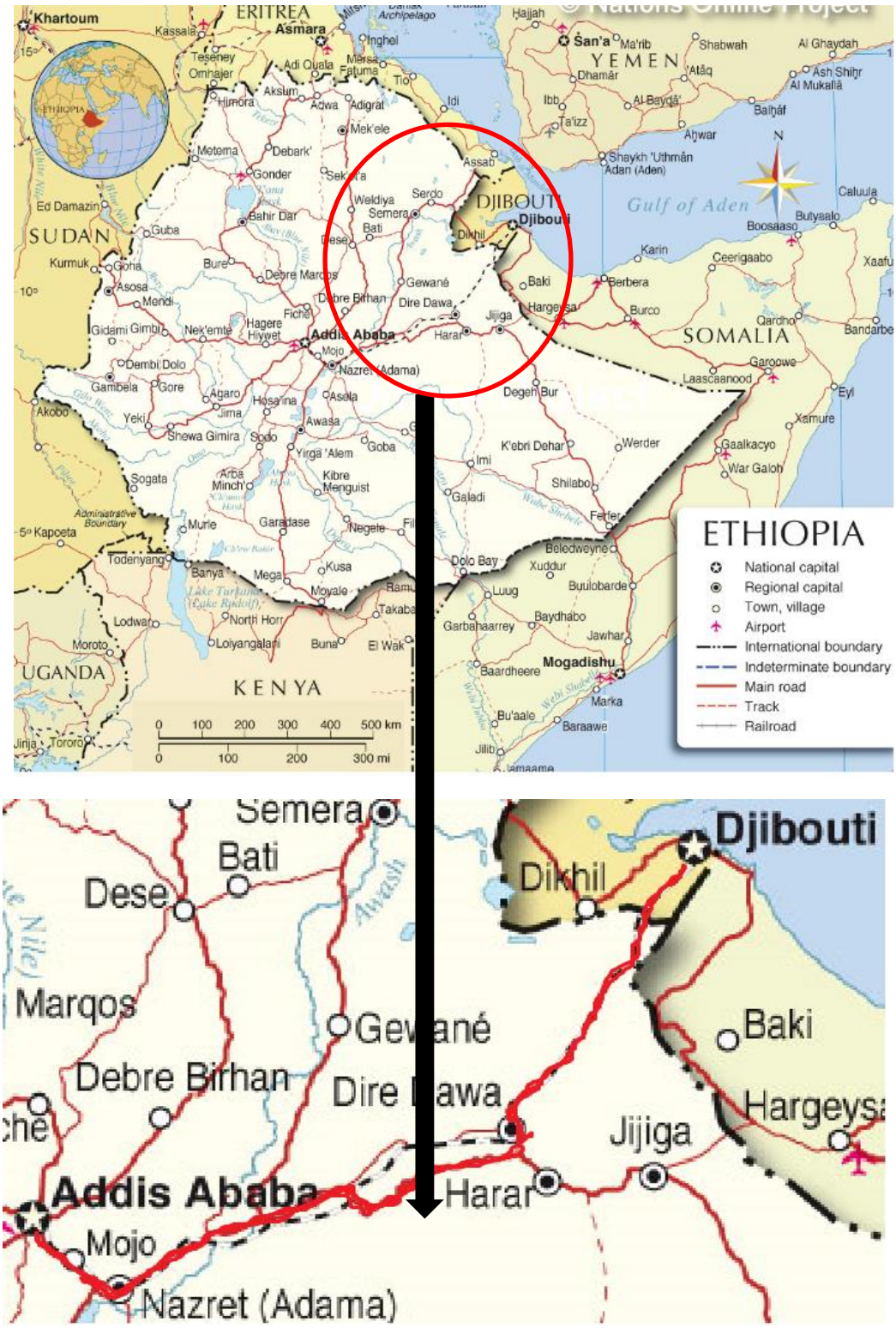

Figure 3: Addis Ababa - Djibouti road map (*Nations online maps*)

4.2 Methodology of the Study

A combination of quantitative and qualitative research methods was employed in this study in order to attain the goal of the thesis work. According to (Creswell, 2009), this model of gathering data and comparing the two data sources was considered important because it allowed to determine if there were a pattern evident in the data. The benefit was that the study contained information from data that were merged. The results produced helps to better understand the phenomenon that was studied.

Accordingly, the research design, method of data collection and their sources, method of analysis are discussed below.

This research project aimed to provide a better understanding of goods transport along Addis Ababa – Djibouti corridor and to indicate relevant opportunities to improve utilization of vehicles in order to estimate the losing environmental and economic aspects.

Qualitative methods included conducting interviews and going through literatures in order to

- map out the Addis Ababa - Djibouti corridor characteristics such as the responsible stakeholders and current situations
- find out the constraints behind the inefficiency of the freight transport industry

Quantitative approach was followed by collecting secondary data from the different stakeholders and from interviews to:

- map out the import and export goods in the country
- to assess the extent of empty running vehicles on the corridor
- to find out the loss in economy i.e. loss of foreign currency
- to find out the loss in environment aspect by calculating CO_2 emission

4.3 Data collection and analysis

The findings, discussions and general thought process of this paper were based on an in depth literature review, semi-structured interviews with relevant persons in the transport industry as well as from secondary data analysis.

4.3.1 Data collection

For the purpose of this study both primary and secondary types of data were collected. These different methods of data collection involved carrying out random interviews and discussions with stakeholders to produce primary data. Moreover, secondary data were also collected from books, journals, project documents and the database of the different stakeholders.

To reflect on the efficiency performance of the freight transport in Ethiopia particularly along Addis Ababa – Djibouti corridor, it was relevant to map out the different parties involved and parameters that contribute to it. Questions such as who are the stakeholders, what does the current situation regarding this issue look like, what is the desired network and what constraints are faced to achieve the desired efficiency come to mind. Hence the following questions were given answer to from the interviews and the literature reviews carried out and hence would be discussed as follows.

Data collection was conducted by carrying out random interviews that include different stakeholders related to the topic. The interview questions was attached in Appendix 3 of this study-

After developing a questionnaire, (including questions about organization, transportation management, delivery destinations, knowledge about the different transportation modes, etc.) and obtaining a support letter from Addis Ababa university in order to approach the different stakeholders in a formal manner, the interviews were conducted in sample companies. The interviews made were mostly face to face. Companies were chosen randomly that represent stakeholders of transport. Some of the companies that participated in the interview include Comet transport, Shimzal transport company, Trans Ethiopia transport company, Shipping lines, Maritime and Transit Services Enterprise (MTSE), Maritime affairs Authority , Ethiopian Customs and Revenue Authority (ERCA), National bank of Ethiopia, Modjo dry port, Ethiopian Roads Authority and Transport authority. The interviews were made with 20 employees of the above mentioned companies who work in different positions.

Secondary data were also collected from the above mentioned companies which include data for major import and export goods, import export volume, list of the different transport companies and number of trucks and their carrying capacity, overloading data from weight stations and so on.

Data quality was ensured through careful and thorough supervision, of each of the applicable steps in all the processes and procedures.

Relevant data was collected from the literature reviews and the interviews that would help in estimating the load factor, empty running rate, the energy consumption and the CO_2 emission

The data collected from the different transport companies and ERCA was used to map out the type of commodity, the origins and destinations, the volume of goods transported and the number of vehicles

The import export data from Maritime Authority, ERCA (Appendix 1) and National bank of Ethiopia (Appendix 2)were used to analyze the Load Factor, Empty running rate, Energy Consumption, The transport imbalance and CO_2 emissions. The tables are annexed in Appendix 1 and 2 respectively.

An effort was made to find more data from Maritime authority in order to have more data to estimate the load factor but this was the only data available due to the fact that it has only been a year since the company started collecting this type of data.

4.3.2 Data analysis

This study has tried to show the status of the transport efficiency in Ethiopia in general and carried out analysis that indicate the economic and environmental performance by performing a case study along Addis Ababa- Djibouti corridor. This was done by

- comparing and contrasting findings with literature reviews
- quantifying the different performance parameters

The Result section was compiled in two ways; the results from interviews and literature were mapped I.e. the stakeholders and the trend of the import and export items for the last five years, along Addis Ababa Djibouti corridor were mapped. The final result was estimated by using mean value and standard deviation.

For the second section quantitative approach was followed and the analysis for trade balance deficit, load factor, empty running rates, the fuel estimation, other truck operating costs, CO_2 emission and loss of foreign currency estimation was presented based on the data collected, literature reviews and the interviews.

Average load and load factor

The load factor was estimated using data from Table 4 and the following formula from literature review where the load factor, or load rate, is expressed as a percentage of capacity in tones, on a loaded trip j, for a freight vehicle, the load factor is the ratio of the load (TON) to total vehicle capacity (CAP). On a given period of the average load is weighted by the loaded distances: the load factor (LF), expressed as a percentage of CAP is then :(Transport Research Arena-Europe, 2012)

$$LF=TON/CAP= (\sum TKM/KM)/CAP \quad \ldots\ldots(1)$$

Vehicle capacity CAP is limited either by rules on weight and dimensions (for instance maximum authorized length and width, maximum axle load for trucks hence the CAP for this study was taken to be 40 based on the literature review.

The load factor was calculated for 2013 from Djibouti to Addis Ababa direction only due to data unavailability. The data for 2013 was found from Maritime Affairs Authority

Empty running rate

The formula for empty running trucks was taken from the literature review as where the proportion of kilometers which are run empty is expressed as percentage of total vehicle kilometers. Noting KM the total distance performed by a vehicle on a certain period, KML and KME the corresponding distance loaded and empty, then the rate of empty running ER of the vehicle was considered as:

ER=KME/KM=(KM-KML)/KM=1-(KML/KM)…….(2)

(Transport Research Arena-Europe, 2012)

The data to estimate the empty running rate was taken from Ethiopian Revenue and Customs Authority and the semi processed data was attached in Table 5. Because of the bulkiness of the data the raw data was not attached in this report but most of the data could be found at ERCA official website.

While estimating Empty running trucks, trucks that might have carried empty containers i.e. without cargo were considered empty.

Estimation of fuel and other truck operating costs

The fuel consumption for the corridor for years from 2009 to 2013 has been estimated by using fuel consumption rates found from the literature review and confirming from the interview results and analyzing it for the whole length of the road. Fuel consumption for large trucks was considered to be 1.5 liters per Km for loaded trucks and 3liters per Km for empty trucks and this value was chosen based on the data found from transport companies from the conducted interviews.

The cost of fuel was also estimated by assuming an average price of 20birr per liter of fuel cost taking into account the market for recent years.
Truck operating cost was estimated using the proportion of truck operating cost in Table 1.

Estimation of CO_2

From the two approaches stated in the literature review, the energy approach was found to be a best fit to estimate the CO_2 emission for this study and hence the following formula was used for estimation.

CO_2 emissions = fuel consumption x fuel emission conversion factor…… (3)
[Tones CO_2 emissions = liters x kg CO_2 per liter fuel / 1.000]

(Responsible Care, ECTA and cefic, 2011)

The emission conversion factor was taken from the following table. The value used for this study was 2.9Kg CO_2/liter

Table 5: Fuel emission conversion factors (Responsible Care, ECTA and cefic, 2011)

Motor Gasoline	2.8		
Diesel Oil		2.9	
Gas Oil	2.9		
Liquefied Petroleum Gas(LPG)	1.9		
Compressed Natural Gas (CNG)			3.3
Jet Kerosene			3.5
Residual Fuel Oil			3.5
Biogasoline	1.8		
Biodiesel	1.9		

Transport Imbalance

The trade balance deficit was estimated using the following formula that was acquired from literature review

Mij = Tji/Tij---------- 4(Olaf, J., Erhan, D., et al)

Where: Mij is the route-imbalance for the route from region i to region j; Tji is the number of trips from j to i, and Tij is the number of trips from i to j.

5 Results

5.1 Mapping out flow of import export goods

In order to map out the import and export goods flow, the raw data from Ethiopia Revenue and Customs Authority Customs ERCA in (Appendix1 and 2) was used. The data downloaded from ERCA contained detailed information such as, gross weight of items moved, net weight, FOB value in Birr and USD, country of origin for import items and country of destination for export, border office, HS code, HS description for every item moved. The HS code is a number assigned to an item description.

The gross Weight is the weight of the payload plus packaging and the weight of the container if containerized. The codes for with border office are codes that show the corridor used for import or export transport.

The data for estimations specific to the case study were made with the data that was filtered by the border office Galafi (GAL) to separate it from the total import and export volume of the country. The raw data was not attached on this report due to its bulkiness but the address for the website could be found in the reference section but the semi processed data was tabulates in Appendix 2. The cumulative data for import and export volumes from 2009 to 2013 along with the percentage share of the import and export along Addis Ababa – Djibouti corridor to the total import and export volumes of the Ethiopia is tabulated as follows.

Table 6: Percentage share of Import and export volumes along Addis Ababa - Djibouti corridor and Total in Ethiopia from 2009 to 2013

Year	Import		Export			
	Total	Addis Ababa Djibouti route corridor	Total	Addis Ababa Djibouti route corridor	percentage of import qty on Addis Ababa- Djibouti route coridr to Total	percentage of export qty on Addis Ababa- Djibouti route corridr to Total
	Gross Wt. (Kg)	Gross Wt. (Kg)	Gross Wt. (Kg)	Gross Wt. (Kg)	%	%
2009	8 218 746 187	7 179 612 362	1 020 007 707	594 235 863	87	58
2010	7 192 253 373	5 804 820 438	1 163 193 052	630 764 941	81	54
2011	7 391 340 720	6 753 249 702	1 214 450 864	631 224 864	91	52
2012	8 593 879 702	8 108 092 128	1 346 967 595	768 902 961	94	57
2013	7 495 366 796	6 842 747 325	1 372 528 645	787 417 288	91	57

The cumulative data from 2009 to 2013 is processed and compiled to observe the trends in import and export movements and for comparison purpose. The gross weight is taken for analysis observation purpose due to its relevance for estimation of vehicle efficiency parameters later on.

The share of the Addis Ababa - Djibouti corridor is shown above in table 6, with a contribution of around 90% on average of moving import goods per year and around 55% of the total share of moving export volume.

This chart shows the import and export volume in millions ton along Addis Ababa Djibouti corridor from 2009 to 2013

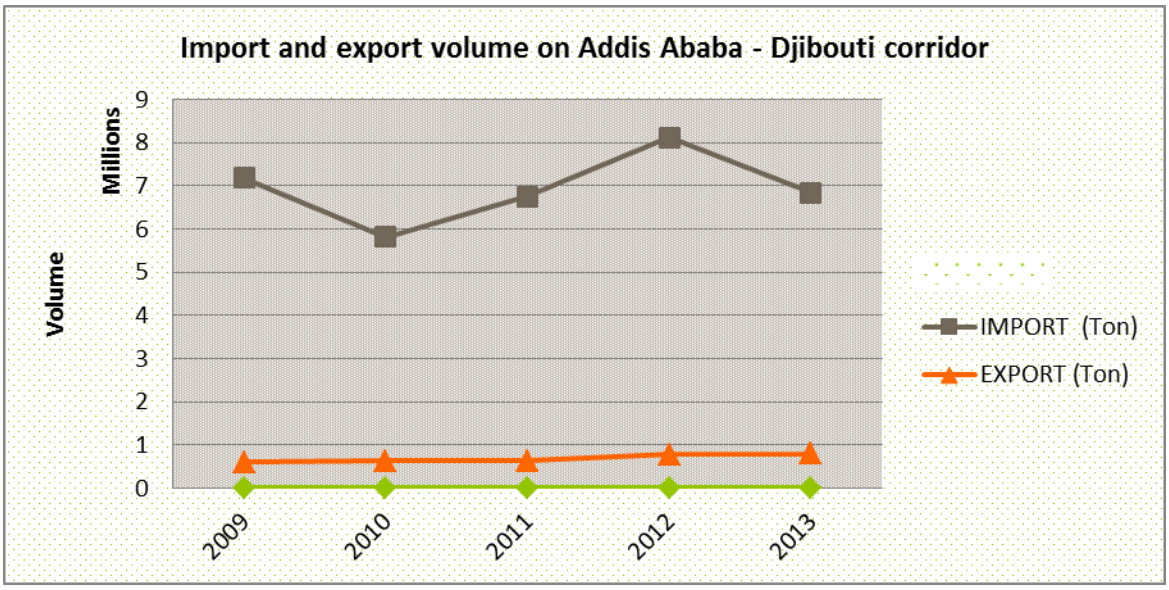

Figure 4: Import and export volume from 2009 to 2013

As shown above in Figure 4, there was a constant increase on the export volumes from 2009 to 2013 with around half a million tons on average per year of export volume for the last five years and a random trend for the import volume with around an average of 7 million tons import on average per year.

To evaluate the trend in the different shares of export items, the data from annual reports of National bank of Ethiopia was used. The data in the 2012 annual report contained export volumes for the major export items from 2009 to 2011 and the data from the annual report 2014 contained export volumes for the major export items from 2011 to 2014.

The top 10 export commodities for the last five years were found to be Coffee, Pulses, Oil seeds, Fruits & vegetables, live animals, Chat, Flower, Meat & meat products, Leather and leather products and Gold. The data was compiled as follows

Table 7: Volume of major Exports in Ethiopia from 2009 to 2014 (National Bank of Ethiopia, 2012 and 2014)

(In Millions of K,G,)

Item Description	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014
Pulses	225,7	224,5	226,2	357,5	353
Oilseeds	299	254,2	367,4	283,9	313,5
Coffee	172,2	196,1	169,4	199,1	189,7
Fruits & Vegetables	66,3	91,6	123,5	135,2	145,4
Live Animals	67,9	112,8	144,9	100,9	105,8
Chat	36,1	41	41,1	47,2	51,7
Flower	36	41,6	46,8	42,4	44,7
Meat & Meat Products	10,2	16,9	17,7	15,5	15
Leather & Leather products	2,9	5,2	4,4	4,6	5,6
Gold	0,0089	0,0112	0,0122	0,0123	0,0116
Total	916,3089	983,9112	1141,4122	1186,3123	1224,4116

The total volume of the major commodities ranges from around 0.9 million tons to 1.2 million tons as shown in the above table 7

The following chart shows the total volume of major export items from 2009 to 2014. The volume on the chart shown below was converted from Kg to tons from the data in the above table 9.

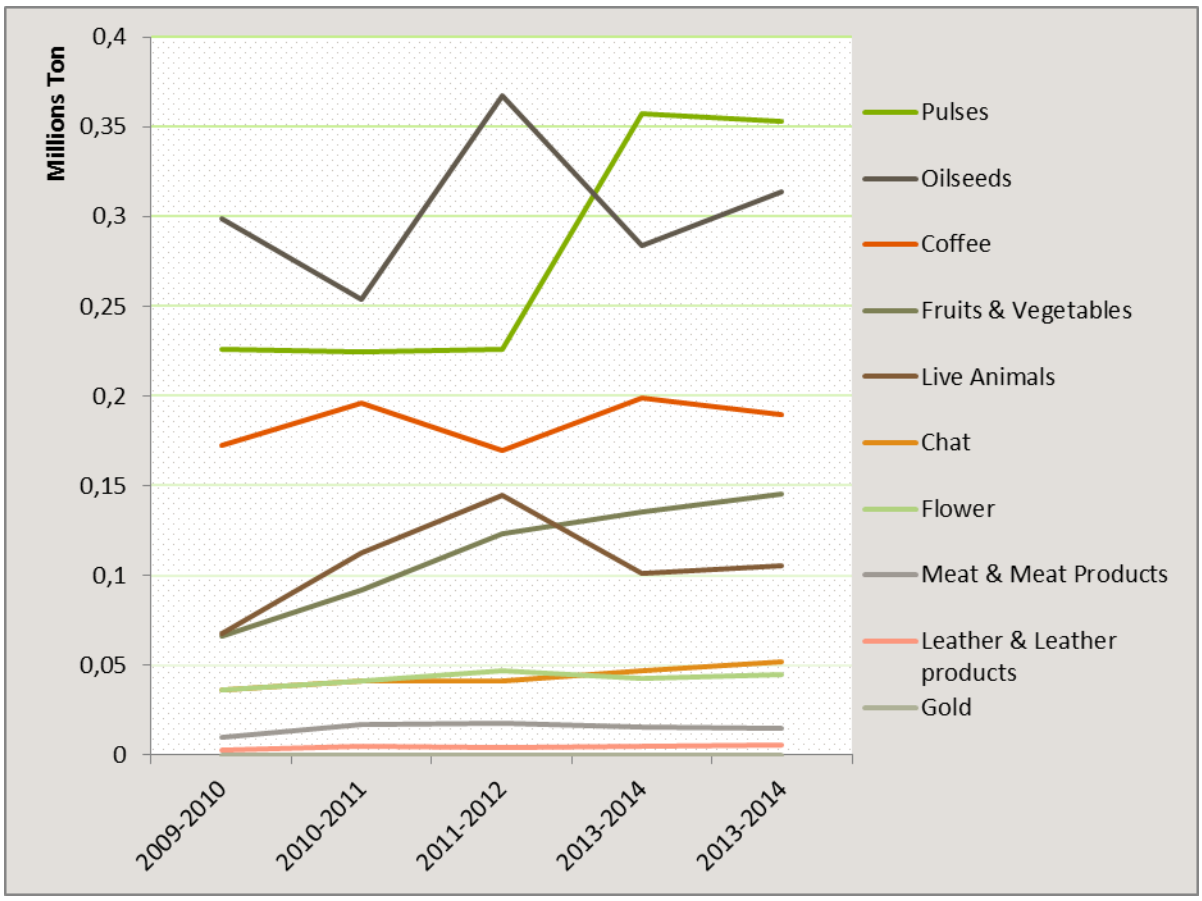

Figure 5: Export volume of selected commodities from 2009 to 2014

For the past five years, the highest export volumes were recorded by Pulse and Oil seeds. While Pulse was showing a rapid increase, the volume of the oil seed shares tends to go up and down. The volume of live animals shows fluctuation and a decrease at the end. Chat, and fruits and vegetables have also been amongst showing a rapid increase for the past five years. Commodities like meat and meat product, flowers, Gold and spices are among the products which have been showing an increase at constant rate.

Commercial bank of Ethiopia categorizes imports by end use, this includes: raw materials, semi-finished goods, Fuel, Capital goods consumer goods and miscellaneous-
Total volume of petroleum imports from 2006 to 2014 is shown in table 8below-

Table 8: Petroleum imports from 2009 to 2014 (Commercial bank of Ethiopia, 2011-2014)

Volume in MT

Petroleum products	2008/2009	2009/2010	2010/ 2011	2011/2012	2012/2013	2013/2014
Regular gasoline	142 983	155756	143 879	150 619	186 518	211 597
Jet fuel	505 701	489779	559 523	544 520	602 427	701 419
Fuel oil	152 704	111570	150 968	144 501	159 297	152 094
Gas Oil	1 170 531	1237077	1 047 862	1 302 451	1 266 563	1 558 341
Total	1 971 918	1994186	1 902 232	2 142 091	2 214 805	2 623 451

5.2 Estimation of load factor, empty running rate, truck operating costs & CO_2 emission

5.2.1 Load factor

The load factor was calculated from the data containing import volume and the corresponding number of trucks that were presented in (Appendix 1). The data contained the goods transported as multimodal, intermodal and bulk. The data for the unmoral section was found to be unrealistic because the number of boxes transported and the weightage corresponding to it did not match and as a result was disregarded from the calculation. The number of trucks that transported the bulk was not given but as per the agency, the average load in bulk transport is found by dividing it by 27. That implies that the average load was assumed to be 27 ton. And hence the average load was calculated for the goods only in the multimodal section.

$$LF=TON/CAP= (\sum TKM/KM)/CAP \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

(Transport Research Arena-Europe, 2012)

Where: Total vehicle capacity (CAP) =40ton

TON= the average load

Using the above formula and assumptions the load factor has been calculated and tabulated below in table 9.

Table 9: Calculated values of Load Factor for 2013

2013	weight (ton)	no of trucks	weight	LF (%)
January	80 386	2 992	27	67
Februar	57 243	2 179	26	66
March	55 851	2 151	26	65
April	73 770	2 682	28	69
May	75 346	2 827	27	67
June	94 879	3 529	27	67
July	100 150	3 756	27	67
August	116 437	4 334	27	67
september	94 831	3 501	27	68
september	77 661	2 939	26	66
November	74 218	2 728	27	68
December	108 088	4 100	26	66
Total	**1 008 860**	**37 718,00**	**27**	**68**

Therefore, the average load and load factor were found to be 27 ton and 68% respectively as shown in the above (table 11).

5.2.2 Empty running rate

To calculate the empty running rate, it was mandatory to know the distance and number of trucks which were running empty. The export data in (Table 6) was used to estimate in how many trucks the export volume could fit. The number of trucks that travelled empty was estimated by assuming the loading factor from Addis Ababa to Djibouti and from Djibouti to Addis Ababa would be similar since there was no recorded data found on number of empty running vehicles. Hence, the number of trucks and the empty running truck was calculated by assuming average load of 27 ton from the above section

The empty running rate was calculated for both legs.

ER=KME/KM=(KM-KML)/KM=1-(KML/KM)……(2)

(Transport Research Arena-Europe, 2012)

Where: Distance travelled empty=925km

Average load = 27

Using the above formula from literature review, the empty running rate from 2009 to 2013 was calculated and tabulated in Table 10 as follows:

Table 10: Number of trucks that moved Import and Export products, volume and empty running rate from 2009 to 2013 along Addis Ababa – Djibouti corridor

Year	IMPORT		EXPORT		TOTAL		
	volume	loded truck	volume	loded trucks	empty running trucks	loded trucks	ER
	Gross wt. (ton)	no	Gross Wt. (ton)	no	no	no	%
2009	7 179 612	265 912	594 236	22 009	243 903	287 920	46
2010	5 804 820	214 993	630 765	23 362	191 632	238 355	45
2011	6 753 250	250 120	631 225	23 379	226 742	273 499	45
2012	8 108 092	300 300	768 903	28 478	271 822	328 778	45
2013	6 842 747	253 435	787 417	29 164	224 271	282 599	44

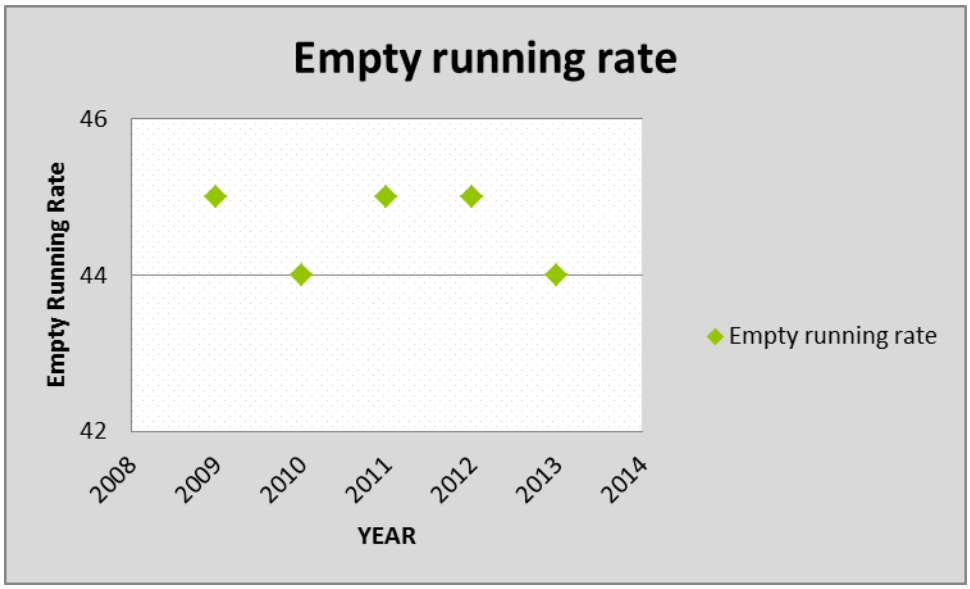

Figure 6: Empty Running Rate along Addis Ababa Djibouti corridor from 2009 to 2013

5.2.3 Transport imbalance in terms of trips

The imbalance which was calculated using the following formula and tabulated in Table 11 below

Mij = Tji/Tij…… (3) (Olaf, J., Erhan, D., Jos, V. and Piet R. 2008)

Where: Mij is the route-imbalance for the route from region i to region j
Tji is the number of trips from j to i, and Tij is the number of trips from i to j.
And hence, the number of trips towards Djibouti (export) = Tji
The number of trips towards Addis Ababa=Tij

Table 11: The imbalance along Addis Ababa Djibouti corridor from 2009 to 2013

Year	Import no of trucks	export no of trucks	Route imbalance
2009	265 912	22 009	0,08
2010	214 993	23 362	0,11
2011	250 120	23 379	0,09
2012	300 300	28 478	0,09
2013	253 435	29 164	0,12

The above (table 11) shows on average of 90% export movement compared to the import movement

5.3 Fuel consumption and truck operating costs

Fuel consumption

Fuel Consumption= Number of trucks moved* distance travelled*Fuel consumption in liters per km……..(4)

The above formula was used to estimate the fuel consumption of the trucks along Addis Ababa – Djibouti corridor. As an input, fuel consumption of 1litre per 3km for empty running trucks and 1litre per 1.5km for loaded trucks was used based on literature reviews and the interviews made with transport companies. The distance used for the estimation was 925Km that is the distance from Addis Ababa to Djibouti. This length is taken because most of the imports get cleared in Addis Ababa as shown in table 3

The fuel consumption for the empty running and loaded trucks along Addis Ababa – Djibouti corridor was estimated and presented in the following table.

Table 12:Fuel consumption by empty trucks along Addis Ababa – Djibouti corridor 2009 to 2013

Year	fuel consumption by empty trucks	fuel consumption by loaded trucks	fuel consumption total	fuel consumption by empty running trucks
	Litre	Litre	Litre	%
2009	75 203 374	177 550 855	252 754 228	30
2010	59 086 436	146 985 592	206 072 028	29
2011	69 912 012	168 657 752	238 569 764	29
2012	83 811 728	202 746 184	286 557 912	29
2013	69 150 374	174 269 192	243 419 566	28

From the above table it is observed that the empty running trucks consumed about 29% of the total fuel consumption needed for the operation.

Truck operating costs

The cost of fuel along Addis Ababa – Djibouti corridor was estimated using the fuel consumption estimate on table12 as an input and a price of 20 birr /liter of fuel. The result is converted to USD by using exchange rate of 1USD-20 birr.

Fuel Consumption has been considered to be 20 to 30% of the total truck operating cost based on the literature reviews Table 1. For this study the share of fuel was taken to be 25% of the total truck operating costs (variable and fixed).Accordingly, the estimate for fuel and total truck operating costs from 2009 to 2013 has been estimated and tabulated below.

Table 13: Truck operating cost for Addis Ababa – Djibouti corridor 2009 to 2013

Year	Fuel Cost		Total truck operating costs	
	all trucks	empty running trucks	all trucks	empty running trucks
	USD	USD	USD	USD
2009	252 754 228	75 203 374	1 011 016 912	300 813 494
2010	206 072 028	59 086 436	824 288 113	236 345 745
2011	238 569 764	69 912 012	954 279 058	279 648 048
2012	286 557 912	83 811 728	1 146 231 649	335 246 913
2013	243 419 566	69 150 374	973 678 263	276 601 496

Figure 7 below illustrates the truck operating costs for the empty running trucks compared to the truck operating cost as a whole

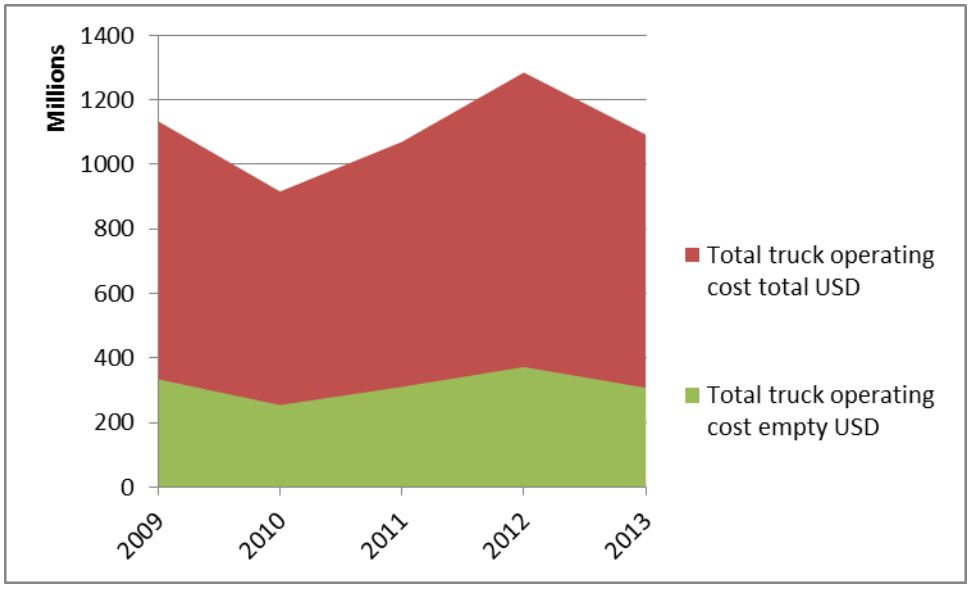

Figure 7: Truck operating cost along Addis Ababa – Djibouti corridor 2009 to 2013

5.4 Estimation of CO_2 emission

The following energy based formula has been used to estimate the CO_2 emissions for empty running trucks, fully loaded trucks and all the trucks along Addis Ababa – Djibouti corridor for the years 2009 to 2013 is calculated and as follows:

CO_2 emissions = fuel consumption x fuel emission conversion factor…….(4)

[Tons CO_2 emissions = liters x kg CO_2 per liter fuel / 1.000]

(Responsible Care, ECTA and cefic, 2011)

The CO_2 emission factor was taken to be 2.9 Kg CO_2/liter from Table 2. , based on the literature review. Accordingly the CO_2 emission from 2009 to 2013 along Addis Ababa – Djibouti corridor was estimated using the above formula, the fuel consumption values from Table 12 and the above fuel emission conversion factor as shown under.

Table14: CO_2 emissions for trucks along Addis Ababa - Djibouti Corridor 2009 to 2013

Year	CO_2 emissions		
	empty running trucks	total number of trucks	empty running trucks
	ton	ton	%
2009	218 090	732 987	30
2010	171 351	597 609	29
2011	202 745	691 852	29
2012	243 054	831 018	29
2013	200 536	705 917	28

From the above (table 14), it was observed that approximately 200,000 tones CO_2 emission was emitted and it contributed 29% of the total emission along Addis Ababa Djibouti corridor

Figure 8: Cumulative CO_2 emissions by empty running trucks along Addis Ababa Djibouti corridor 2009 to 2013

6 Discussion

6.1 Efficiency Constraints along Addis Ababa Djibouti corridor

So far the different characteristics of the freight transport such as the stakeholders and the import export transport goods and trends were mapped and analysis were carried out to estimate the performance of the transport along Addis Ababa Djibouti corridor. Mapping out the responsibilities of the stakeholders in combination with the constraints have indicated the direction of the inefficiency of the current transport. Literature reviews and interviews with the freight transport stakeholders provided a good insight in the current transport system. A discussion with the transport providers gave a better understanding on the constraints of the freight transport.

Based on that, the results with respect to the performance factors stated in the literature review associated with freight road transport such as the operating cost. Level of service aspects (travel time, reliability, safety, comfort and security) and environmental impacts would be discussed as follows
The inefficiencies of the operation of the stakeholders such as the customs procedure is hindering the smooth movement of the freight transport by contributing to the empty truck flow which in turn contributes to delay for the users and loss of fuel and truck operating costs and as a result of this the country is missing economic and environmental benefits. Import export processing times are taking very long.

Lack of using information technologies was also contributing to the inefficiency of the network. Transparency is lacking due to the shortage of communication.

The following points concerning the efficiency performance parameters were deducted from the interviews

Productive time

The different transport companies stated that the loss of time due to loading and unloading of goods. Export goods are very hard to find but even when they do the customs clearing time and unloading process at port is time taking that they would rather go empty and load on the way back. Otherwise they would lose their productive trips.

Overloading

It is very common to see overloaded trucks along the Addis Ababa - Djibouti road corridor. In order to know the extent, data was collected from Ethiopian roads Authority for Awash and Modjo stations which are found to be pertinent to this study. The percentage of overloaded trucks is summarized as follows:

Table 15: Legal and Illegal loading on Modjo and Awash Stations

Year	Modjo				%	Awash				%
	Front	Rear	Front	Rear		Front	Rear	Front	Rear	
	Legal	Illegal	Legal	Illegal		Legal	Illegal	Legal	Illegal	
2008/09	58710	758	100114	71706	72	26627	233	72335	46719	65
2009/10	63658	901	179884	28889	16	27900	680	106386	26389	25
2010/11	60949	727	160258	14044	9	222000	362	87602	16829	19
2011/12	46426	117	139381	7055	5	27782	405	118708	14913	13
2012/13	58250	378	169055	14650	9	35138	325	162308	10010	6

The overloading for Awash weight station was roughly around 9% and 6% for in Modjo weight station as per the data from Ethiopian Roads Authority but other litratures suggest that the actual overloading was much higher than the data documented. According to (Biniyam, T., 2014) it goes as high as 54.4% at Modjo weighbridge

Increase of transport prices

The reason for the increase of transport prices was twofold, as per the interview, the increasing costs per kilometer result in higher prices to be paid by the customer. There was also the issue of the market mechanism of supply and demand. Since demand was higher than supply (import and export in this case), transport prices tend to go up.

CO_2 Focus on carbon footprint

It had been noted previously that reducing the carbon footprint represents a company's responsibility to reduce their CO_2 emission, while maintaining the same performance levels but there was nothing being done in company levels to decrease their share of CO_2 contribution.

Fragmented transportation market

There were different stakeholders that were active players in the transportation market, but there was no system that connects and lets them work together. This made the freight transportation system very fragmented owing to less coordination and important data not being documented in between.

Safety

There was a need by transport companies to work the night shift to increase their monthly trips in order to generate more income. A safety issue was raised by the transporters on this regard.

The cross border Transport companies were generating their revenue mostly from the import market and hence they needed to make as many trips as possible to Djibouti and transport import goods but security and working hour limitations were hindering them from doing this

6.2 Import & export

One of the purposes of the study was to understand the impact of the transport inefficiency on the economy and the environment. It has also been discussed that transport was found to be a major indicator of economic strength and directly related to the health of the environment. The majority of benefits and disadvantages come from movement import and export of goods. On this regard, Addis Ababa- Djibouti corridor being the main corridor for import and export movements, it was apparent to focus on that particular case.

When this was put to figures, of the total import and export movements, the contribution of this route was around 90% on average of moving import goods per year and around 55% of the total share of moving export volume, confirming the above said theory. From this it was well understood that improving the efficiency of the transport movement on this corridor would have tremendous impact in contributing to the overall economy and the environment of the country.

One of the factors that contribute to the inefficiency of transport was the gap between import and export volumes. As shown on Figure3, a huge trade balance deficit was observed on this corridor with half a million tons on average per year of export volume and 7 million tons import on average per year for the last five years. Moreover the transport imbalance measure in Table 11also shows that there was around 90% trade balance deficit on the corridor.

Therefore in order to attain efficient transport along this corridor the trade balance deficit issue needs to be addressed. The trade balance deficit was a result of the shortage of export commodities.

As shown in Table 7 in the above section, the major export commodities for the last five years were found to be Coffee, Pulses, Oil seeds, Fruits & vegetables, live animals, Chat, Flower, Meat & meat products, Leather and leather products and Gold.

Back in the days, coffee was playing a very important role as a source of foreign exchange earnings but as shown in Figure 4 it has been dominated by Pulses and oil seeds for the past five years. This indicated that the dominance of coffee export over the years has ended but there was still more to be done. It still one of the pillars of the economy ranking third on the chart of foreign currency earnings for the past five years. Studies made on this area indicate that there is still ample potential in the area.

From the results it has been observed that there were commodities showing a rapid increase, a constant increase and commodities that are showing fluctuations with a decrease at the end. It indicated that the export sector is heading forward but to address the imbalance issue a lot is

expected from this sector. And hence the reasons behind the increase and decrease trends must be investigated in order to understand the barrier and the positive trends.

The implementation of cost reducing methods of production would be essential to increased global competition.

The total volume of the major commodities imported ranges from around 0.9 million tons to 1.2 million tons.

This made up 87% of the total export for the last five years. Hence, diversifying the options of export items could be one way of combating the imbalance problem.

The largest export for Addis Ababa Djibouti corridors was registered 2013 and the volume goes down as the years decrease

Enhancing the export sector was found to be very useful to bring economic growth. Moreover, a huge foreign exchange requirement has been witnessed in Ethiopia in the recent past years owing to the increasing need for capital goods import to speed up and sustain economic growth, and to meet the ever expanding appetite of consumers for imported consumer goods. Consequently, the nation is needs to exert additional efforts to solve the foreign exchange bottlenecks the country had been facing for long and hence enhancing export requires a constant follow up and conducting problem solving researches.

6.3 Load, factor and empty running Rate

The load factor in this study was estimated to be 68%, whereas from Literature review UK stands at 63 % LF between 1986 and 1996 , Denmark 70 % in 1984 to 47 % in 1996 etc.

The load factor was calculated from a one year data and may not be the best representative value for the corridor but the number roughly matches with the interviews and the data found from literature reviews hence it was used to calculate the number of trucks in order to estimate the empty running vehicles.

As shown in Table 15. The overloading estimated using Ethiopian Road Authority data had been decreasing drastically in the past five years. But still showed 6% and 9% overloading which were contributing to higher load factor values. But actual overloading was much higher as per other studies mentioned above

The freight forwarders have a great share on improving the load factor since their line of work involves with grouping of cargo. Even though this is the case their work is not currently supported by advanced information technology. Hence they follow the traditional method which is less efficient to achieve better vehicle utilization level

Empty running trucks

The empty running rate for this study varies between 44% and 46% as shown in table 10.

As had been pointed out in the literature trucks were running empty for 13% of the distance travelled in Latvia and 17% in Denmark, while this proportion seems to be much higher in Greece (35%) and in islands (38% in Ireland and up to 45% in Cyprus).

The load factor compared to other countries was not that bad on the other hand the empty running rate was one of the lowest rates found in the world. From the analysis it was apparent that the major bottleneck for the efficiency of the Addis Ababa - Djibouti corridor was the empty running trucks. Although it might not be possible to totally eliminate the empty running vehicles because some commodities such as fuel need special kind of trucks, there still remains a wide gap that needs to be addressed.

Improving the load factor would also help in minimizing the total truck movement and as a result benefit environment by reduction of CO_2 emissions and the economy by further cutting down the operating costs. If the load factor could be improved by coordination to a 100%, the number of trucks to transport the load would decrease by 32%. Accordingly the truck operating costs and the CO_2 emissions would decrease by the same percent.

The prevalence of the trade balance deficit was also noted in the above section tends to aggravate the gap between import and export volumes.

6.4 Fuel, other truck operating costs and foreign Currency

The truck operating cost to move the empty running trucks roughly cost 300 million dollars for the past five years. This shows that the country is losing a tremendous foreign currency without gaining benefit out of it.

6.5 CO_2 emission

The cumulative effect of CO_2 emission in Figure 7 showed that roughly one million tons of CO_2 had been emitted in the past five years and a total of 700,000 tons of CO_2 emission from the transport along Addis Ababa – Djibouti corridor
On this regard, the CO_2 emission is high but most importantly it is being emitted without even putting it to a good use. The inefficiency that is being experienced as a result is very high and mitigation measures should be in action for sustainable development.

If the vehicle utilization level could be improved, through reduced empty running and making better use of each vehicle's carrying capacity then the truck operating costs would be generating revenues instead of being just a loss. Therefore it calls for an efficient transport to improve the economic growth that takes into account the emissions that drives climate change.

7 Conclusions and Recommendations

7.1 Conclusions

This study has showed that, the impact of the inefficiency of the freight transport is tremendous and it affects the economy and the environment and hence it needs be addressed to improve the economic growth and takes into account the emissions driving climate change.

On this regard, minimizing the empty running vehicles by coordination will highly be beneficial for reduced CO_2 emissions and for saving foreign currency.

Based on the analysis, the results and the discussion of this study, the following conclusion could be reached:

1. There is no transparency between the different stakeholders and hence inefficiencies occur on a regular basis;
2. The major constraint that was hindering efficient transport along Addis Ababa-Djibouti corridor was caused by the empty running trucks which were a result of the trade balance deficit and lack of coordination in vehicle utilization.
3. The export sector has shown an increase over the past few years but the gap with the import is still very wide showing 90% in transport imbalance. More than 87% of the export is dominated by few commodities and therefore enhancing the export sector is very useful to bring economic growth by diversifying the range of commodities.
4. Empty running rate in the Addis Ababa – Djibouti corridor was 45%
5. Load factor in Addis Ababa Djibouti corridor was 68% during 2013. Lack of coordination is contributing to a reduced load factor.
6. The country is losing roughly of300 million dollars a foreign currency every year without profit due to empty running trucks
7. A CO_2 emission of about 200 000 tons per year was emitted during empty running without actually generating revenue, although the need to sustain green economy is stated in the policy, the concern for environmental degradation due to vehicular emission per institution level is quite poor.
8. Increasing the load factor by coordination would decrease the number of trucks moved and as a result the truck operating costs and the CO_2 emission would decrease accordingly
9. Little attention has been given to this sector that there is no enough data available to research on its improvement

7.2 Recommendations

- Improving the load factor by coordination
- To achieve better and efficient freight transport, shortage of agricultural inputs, narrow product range should be given attention and researched. Thus, the government needs to strengthen and extend the export market and widen the product range to speed up the growing trend.
- Minimizing the gap between import and export
- Transparency leads to the ability to design an efficient system therefore corporation between all actors/stakeholders of the freight transport in a transparent way can improve the efficiency of the system. . Once the transport system is transparent and responsibilities are centralized, there is a major opportunity to improve the efficiency of the freight transport.
- The development of the culture for measuring, registering and storing of many different parameters related to transport accompanied with proper database management system is very important for decision making at any level and conducting researches. And hence data such as empty running trucks, vehicle capacity, size of vehicles etc should be documented
- Conducting detailed, relevant to the current conditions and advanced researches should be carried out. The researchers conducted should be used as a basis by transport planners, policy makers and decisions at any level.

References

Asnake, T. Road Freight Transport in Ethiopia With Special Emphasis Along Addis Ababa – Djibouti Corridor.

Kifle, A., Gebray, T. et al. (2000) Cargo Transit Challenges in Ethiopia

Daniel, G. (2011) The Trade – Balance Creed

Korinek, J. and P.Sourdin (2011),'To what extent are high quality services trade facilitating?' OECD Trade Policy Papers, No. 108 OECD Publishing

Fekadu D. (2013) Logistics practices in Ethiopia

Fredrik D. Eva S. (2013) Evaluating the efficiency of ELMs: an international backhauling perspective-The case of Poland Sweden

Heinrich B. (2009) Freight Transport for Development Toolkit. World Bank, DFID (Department for International Development

Jean-Loup, M., Jacques L.et al. (2010) Importance of the loading factor in transport CO_2 emissions

Ljungberg, D. (2006) Effective transport systems in food and agricultural supply for improved economy, environment and quality, doctoral dissertation

Olaf, J., Erhan, D., et al. (2008) Endogenous Transport Prices and Trade balance deficits

Nadine N., Jean-Luc M. et al. (2004) Analysis of the load factor and empty running rate for road transport

Niklas, A. (2011) Operational freight transport efficiency – a critical perspective

Responsible Care, ECTA and cefic, (2011) Guidelines for measuring and Managing CO_2 Emission from freight transport operations

Transport Research Arena-Europe, (2012) Reducing freight transport CO_2 emissions by increasing the load factor

Robel M. (2013) Experience in measuring transport emissions in Ethiopia

Techane, B. (2013) Integration of Logistic Network in Local Food Supply Chains

The Addis Ababa Chamber of Commerce and Sartorial Associations and SIDA (2009) The Management of commercial Road Transport in Ethiopia

Wiedmann, T. and Minx, J. (2008) A Definition of 'Carbon Footprint'. In: C. C. Pertsova, Ecological Economics Research Trends: Chapter 1, pp. 1-11, Nova Science Publishers, Hauppauge NY, USA.

World Bank and Middle East & North African Region Transport Unit (2013) Transport and logistics in Djibouti: contribution to job creation and economic diversification

Vendela S. (2013) Exploring logistics actions enabling environmentally sustainable freight transport

Verhoeven S.P. J.W. (2008) Backhauling; the optimal Road to Everest-A study on the Optimization Opportunities for the Uniliver European Routing Network

Yung-yu, T. Wen, L. et al (2005), The role of transportation in logistic chain

http://www.worldbank.org/transport/roads/rdt_docs/annex1.pdf Measuring road transport performances

http://www.theglobaleconomy.com/Ethiopia/CO_2_emissions_from_transportation

http://www.erca.gov.et/

http://www.nbe.gov.et/

Appendices

Appendix 1: Import data in 2013 (Maritime Affairs Authority)

month	multimodal					unimodal			RO/RO	B/ BULK
2013	20ft	40ft	box	weight(tonnage)	no of trucks	unimodal box	weight(tonnage)	no of trucks		
January	2283	1663	3946	80 386	2 992	4699	83 992	12 662,00	11	348 925
February	1804	1131	3039	57 243	2 179	4939	81 852	12 127,00	0	332 039
March	1578	1161	2739	55 851	2 151	5417	93 944	13 801,00	373	384 568
April	2460	1278	3738	73 770	2 682	4506	71 311	14 573,00	188	422 663
May	2538	1288	3826	75 346	2 827	4655	83 465	12 511,00	312	366 312
June	3087	1696	4783	94 879	3 529	4571	78 796	12 273,00	260	345 819
July	3175	1847	5022	100 150	3 756	5519	94 070	12 082,00	272	331 389
August	3636	2185	5821	116 437	4 334	5224	92 398	9 636,00	274	231 776
September	2293	2234	4527	94 831	3 501	4794	81 871	9 176,00	261	226 737
October	1683	1962	3645	77 661	2 939	4356	82 751	10 884,00	241	284 649
November	1904	1674	3578	74 218	2 728	6237	106 306	15 206,00	219	420 492
December	3014	2274	5288	108 088	4 100	5526	94 880	15 795,00	459	454 930
TOTAL	**29455**	**20393**	**49952**	**1 008 860**	**37 718**	**60443**	**1 045 634,72**	**150 726,00**	**2870**	**4 150 299**

Appendix 2: Import export data from 2009 to 2005 (Ethiopian Revenue and Customs Authority)

	IMPORT						EXPORT				
	TOTAL		GALAFI		TOTAL		TOTAL		GALAFI		
Year	Gross Wt. (Kg)	Net Wt. (Kg)	Gross Wt. (Kg)	Net Wt. (Kg)	CIF Value (USD)	Total tax (USD)	Gross Wt. (Kg)	Net Wt. (Kg)	Gross Wt. (Kg)	Net Wt. (Kg)	CIF Value (USD)
2009	8 218 746 187	8 133 063 070	7 179 612 362	7 098 894 604	7 622 854 167	1 248 174 896	1 020 007 707	909 832 983	594 235 863	589 490 420	1 493 635 743
2010	7 192 253 373	6 959 270 456	5 804 820 438	5 579 237 746	8 327 332 580	1 529 592 388	1 163 193 052	1 130 365 384	630 764 941	624 068 835	2 147 314 405
2011	7 391 340 720	7 309 527 670	6 753 249 702	6 673 800 808	8 758 393 035	171 793 478 876	1 214 450 864	1 182 914 011	631 224 864	624 604 218	2 542 304 496
2012	8 593 879 702	8 464 799 038	8 108 092 128	8 006 061 489	11 659 257 528	2 245 447 691	1 346 967 595	1 318 949 960	768 902 961	763 010 137	2 741 297 676
2013	7 495 366 796	7 343 062 892	6 842 747 325	6 778 841 324	10 955 385 470	44 277 644 232	1 372 528 645	1 339 010 495	787 417 288	779 857 221	2 591 041 909

Appendix3-Classification by number, age and ownership of trucks

Appendix-4 Interview questions

Interview questions

1. Name of the company

2. Position of the interviewee

3. Type of the company

    a. Associate b. share company c. Private limited company d. owned by government e. enterprises f. others

4. Is there any legislation that is being a problem for coordination for example driving and loading at night? If yes what are exactly the problems?
    a. Yes b. no

5. Is there any waiting time in loading and unloading items in port or elsewhere? If yes where is it?
    a. Yes b. no
6. Are there any materials that cannot be loaded with others because of their hazardous nature? Are there any rules related to that? If Yes what are the materials?
    a. Yes b. No
7. Is there a specified maximum weight and volume versus the capacity of the truck?
    a. Yes b. No
8. In terms of combining certain goods, are there any rules or limitations on what products may be combined and what products must be separated?
    a. Yes b. no
9. How many loads are transported per year?
10. What is the maximum number of loads per week?
11. Are there any goods that need a temperature controlled environment?

a. Yes b. No

12. Do some products have limited shelf life (expire fast) and therefore may result in less flexibility to combine?
    a. Yes b. No
13. What is the percentage of the different type of trucks on the road (truck/trailer)?
14. Who are the different stake holders that need to address for this paper?
    - Road Transport
    - Import/export office
    - Ministry of customs and revenue
    - Shipping lines
    - Freight forwarders

15. What are the type, capacity and size of trucks commonly used by your company?

16. Is there Import and export Traffic imbalance? If yes, why do you think is that?
    a. Yes b. No
17. Is there any seasonal variation between the two? If yes, which seasons are high on export and vice versa?
    a. Yes b. No
18. Are there commodities that require handling (grain/fertilizer) for instance?
    a. Yes b. No

19. What is the fuel dosage when running empty and fully loaded on both trips?

20. How has the dry port in Modjo or elsewhere affected the transport and what is its advantage in minimizing or increasing the empty millage?

21. Do you think coordinating import and export trips will have an advantage to your company if all the constraints were improved?

22. What are the challenges for not loading both ways?

23. What percentage of your trips is dependent on Addis Djibouti route corridor?

24. What is the transport rate? To Djibouti and from Djibouti?

25. Do you carry full load or a part of it? Load rate?

26. Who covers the loss due to the empty run millage? Customer, transporter or is it shared?

27. Do you always use containers to transport goods?

    a. Yes b. No
28. Who owns the containers?

29. Would it be possible to load the containers with import stuff and then load it back with export goods?

30. What is the standard size of the containers?

31. The year the trucks are made to estimate the CO2 emission from the cars?

32. Where can I find axle load survey data for both and import goods at the same time of week?

33. Are there any warehouses?

34. How do you find a load? Do the freight forwards help or do you have any other way? Are there any websites that facilitate this?