



SELINUS UNIVERSITY
OF SCIENCES AND LITERATURE

**QUALITATIVE ASSESMENT AND QUANTITATIVE
ANALYSIS OF KEY ISSUES AND FACTORS IN THE
EVOLUTION OF ETHIOPIAN ROAD, TRANSPORT
AND LOGISTIC SECTORS: TRENDS, PROBLEMS,
CHALLENGES AND PROSPERCTS**

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DECLARATION

The dissertation titled **“QUALITATIVE ASSESMENT AND QUANTITATIVE ANALYSIS OF KEY ISSUES AND FACTORS IN THE EVOLUTION OF ETHIOPIAN ROAD, TRANSPORT AND LOGISTIC SECTORS: TRENDS, PROBLEMS, CHALLENGES AND PROSPERCTS”** submitted to Selinus University of Sciences and Literature, Faculty of Engineering & Technology, in Fulfillment of the Requirements for the Degree of Doctor of Philosophy (PhD) in Transport and Logistic, is my original work and the dissertation has not formed the basis for the award of any other degree, or any other associateship or fellowship.

The thesis beefed up by hands-on experience and years of exposure to the transport and logistics sector activities and programs. Reference materials borrowed from other sources incorporated in the dissertation have been duly acknowledged.

“I do hereby attest that I am the sole author of this thesis and that its contents are only the result of the readings and research I have done”.

Date: July 31, 2023

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Signature of Student: UNISE2030IT

Abstract

Development of efficient and effective transport and logistics system is a critical element for social services and sustainable economic development. Cognizant of the fact that the Road, Transport and Logistic sectors play critical role, in the context of Ethiopia, the objectives bases of the PhD thesis is to make an in-depth analysis on key issues and critical factors from the angles of evolving trends, problems, policy issues, concerns, potentials and prospects of the sectors. Based on qualitative assessment and quantitative analysis, the thesis present the authors perspective on key issues, and critical factors, in light of general trends, problems and challenges, strengths and weaknesses, threats and opportunities and prospects in the dynamic evolution of Road, Transport and Logistic sectors. The road sector development programs assessed against achievements in creating an enabling environment to access the untapped potentials and penetrate into resource rich areas of the country. Huge investment outlaid for new road construction, maintenance and upgrading of the existing road network, assessed in confirming that the Road infrastructure has the biggest public asset value for the country.

As air and rail transportation have limited modal share, in Ethiopia, the Road transport takes the lion's share of more than 95 percent of motorized inter-urban passenger transportation and freight movements and will continue to play predominantly detrimental role to the Transport and Logistics sector. As a prelude of sector issues, the background and introduction present situation of the past and present evolutionary trends of the sector. The evolution from centrally controlled to liberalized market-oriented practices discussed, and gradual processes of commercialization, deregulation and operational implications discussed in light of the respective period policies, trends, challenges and achievements. Common problems associated to the transport and logistics sector qualitatively assessed, and quantitatively analyzed, to ascertain the prevalence and implication of high cost of transport, low level of accessibility and suppressed demand, provision for infrastructure development, inefficient transport management, lack of co-ordination and weak enforcement capacity. Analytical assessment-based generalization are made with due reference to lessons from practices, results from secondary database analytical work, research and study findings, review of references material, and lessons learned from elsewhere.

Findings and results of the research analytical work on Road, Road Asset, Road Financing, Road Fund, Road Transport services, Urban Transport and Mobility, Trade Logistics and Transport main contents presented in the respective core chapters of the thesis. The thesis has six key chapters, with background and introductory part, qualitative assessment and quantitative analysis of key aspects, issues and factors included in main chapters for structured and smooth flow on contents of the analytical work. Finally, analytical work of thesis presented in structurally readable format, following the standard presentation format of Selinus University, for the acquisition in fulfillment of the requirements for the Degree of Doctor of Philosophy (PHD) by research in Transport and Logistic.

Key words: Road, Transport, Logistics, Asset, Fund, Urban, Mobility, Qualitative, Quantitative, Trends, Challenges, Prospects, Urban Transport and Mobility, Trade Logistics and Transport

EXECUTIVE SUMMARY

Development of efficient and effective transport and logistics system is a critical element for social services and sustainable economic development. Cognizant of the fact that the Road, Transport and Logistic sectors play critical role, the PhD thesis looked into the general trends, problems and challenges, strengths and weaknesses, threats and opportunities and prospects of the sector in the context of Ethiopia. The analytical work present the authors perspective, on key issues and critical factors, in the evolution of Ethiopian Road, Transport and Logistic sectors. Dynamic trends of sector development quantitatively analyzed, and diagnostics situation of Ethiopian Transport and Logistics sector qualitatively assessed in light of evolving trends, problems, policy issues, concerns, potentials and prospects. Thesis qualitative discussion and results of the quantitative analysis present findings related to the Road, Transport, Urban Transport and Logistics sector. Analytical assessment-based generalization made with due reference to lessons learned from practices, secondary data base analysis, research and study findings, review of references material, and lessons learned from elsewhere.

As prelude to the sector, the background and introduction sections are to keep informed of the past and present evolutionary trends of sector development. Common problems associated to the transport and logistics sector qualitatively assessed, and quantitatively analyzed, to ascertain prevalence of high cost of transport, level of accessibility and suppressed demand, weak provision for infrastructure, inefficient transport management and lack of co-ordination, absence of clearly defined transport policy and weak enforcement capacity. The evolution from centrally controlled to liberalized market-oriented practices discussed, and gradual processes of commercialization, deregulation and operational implications discussed in light of the respective period policies, trends, challenges and achievements. The road sector programs designed to create enabling condition to access the untapped potentials and penetrate into resource rich areas of the country.

Ethiopia is a landlocked country, with a land area of 1.1 sq. km, and a population estimate of about 120 million in 2020. With annual growth rate of 3.5%, the population estimated to grow to almost 150 million by 2030. Rural to Urban population distribution is in the range of 85% to 15%, and crude density of 63.5 people per sq.km. The total stock of Ethiopian road network is 144,000 kilometers, and planned to grow by about 70%, to reach to about 246,000 km by 2030. According to results of the RNET model analysis, the road asset value estimated to be Birr 664.0 billion (16.6 billion USD), and the corresponding current road asset value estimated to cost Birr 540 billion (13.5 billion USD); exhibiting the reduction of asset value by 18% due to inadequate maintenance. With annual increase of 15%, the Road Fund revenue estimated to be about Birr 70.0 billion, against the total current requirement of Birr 145.0 billion; and estimated to escalate to Birr 337.0 billion over the coming 10 years; five-fold difference between revenue and expenditure, or the Road Fund collection is only about 20% of the requirement.

In Ethiopia, as air and rail transportation have limited modal share, the road transport service sector will continue to play predominantly detrimental role to the Transport and Logistics sector. Taking the lion's share of the overall transportation services, the Road transport currently account for more than 95 percent of motorized inter-urban passenger transportation and freight movements

of the country. The total number of vehicles registered and inspected on record is 1.4 million vehicles, and vehicle population over the last three decades steadily growing at an average rate of 10 % per year. However, more than 80% of vehicles moved only on less than 10% of the total road network, and the traffic concentrated on paved roads in central part of the country; mainly radiating from Addis Ababa. Fast-growing population in cities, about a third living in Addis Ababa, creating a huge gap of suppressed demand related to supply shortfalls and inadequate urban transport service provisions. On daily average bases, there are about 2.2 million people using public transport in Addis Ababa; which is equivalent to a total of 3.6 million trips per day.

Huge investment outlaid for new road construction, maintenance and upgrading of the existing road network, and hence the Road infrastructure takes the biggest public asset value. The Road Fund concept framework introduced to ascertain that road users should pay the cost of provision for road use, and hence revenues generated from road users conversely be used to cover road costs. The road fund serve as main source of finance for road maintenance, road safety and other road expenditures. A key reason for setting up the road fund was that road maintenance was not given adequate attention it deserves, and unawareness on road maintenance yields the highest economic return. The thesis examined the current road system costs, as well as expenditures, in making comparisons between sufficiency of fund revenue with maintenance costs.

The high cost of road transport operation making trade and logistics uncompetitive, and goods and services expensive, to the local and international market. Over 90 percent of the country's import-export trade volume use the Addis-Djibouti corridor, connected by road and rail, and hence Ethiopian import export trade mainly relies on Djibouti port and corridor. For the foreseeable future, the port of Djibouti will continue to serve as the main gateway, and Djibouti corridor the main arterial route for the countries import and export trade, and international trade logistics. To reduce trade costs and logistic hurdles, the priorities have been set for railway development, assuming modal shift of road to rail, to move import and export goods and commodities. However, even if the rail link capacity to double, there will still remain the need for more than 15 million tons to be moved by road, to be complimented by non-tariff barrier for seamless and efficient use of the road and railway line. The fact that Transport and Logistics has detrimental role to play, in the context of Ethiopia, there is strong reason and rational for having in-depth analysis on level of import export trade imbalance, which is causing significant imbalance to cargo transport to and from the country. Addis-Djibouti Corridor Road is the artery of transport for Ethiopian imports and exports and have lifting capacity of 16.5 million tons whereas the Railway carry smaller volume of freight in order of about 1.6 million tons.

Critical aspects and influential factors to trade and logistics in terms of time, capital, economy and adverse social effects assessed, and finally, the analytical results of thesis presented in structurally readable format, following the standard presentation format of Selinus University, for the acquisition in fulfillment of the requirements for the Degree of Doctor of Philosophy (PHD) by research in Transport and Logistic. The thesis six key chapters, with background and introductory part, and qualitative assessment, and quantitative analysis, of key issues and factors included in main chapters structured for smooth flow of the reading.

CHAPTER ONE

1. INTRODUCTION

1.1. Background

Ethiopia, located in the eastern part of Africa, which is commonly referred as the horn of Africa, is neighboring with Djibouti to the East, Eritrea to the North, Kenya to the South, Somalia to the South-east, Sudan and South Sudan to the West. With land area of 1.1 million square kilometers, Ethiopia is the second most populous country in Africa, next to Nigeria, and have an estimated population of 120 million, growth rate of population recording as high as 3.5% per year. According to the United Nations (UNDP : Ethiopia 2030), the population will rise from an estimated 117 million in 2020 to almost 150 million in 2030, which has a projected increase of 27 percent over a period of a decade. Rural to Urban population distribution ratio is in the range of 85% to 15% respective to total population. Crude estimate on population density is about 63.5 people per sq.km (CSA), with scattered population settlement pattern ranging from 8.4 persons per sq. k.m in Gambella region, south-west of Ethiopia, to about 5,000 people per square k.m. in Addis Ababa.

Ethiopia is a landlocked country, and Djibouti port serve as the main gateway for the countries import and export, international trade. As backbone to the economy, Road Transport plays significantly dominant role to the Socio-Economic activity of the country. The Road Transport modal share takes more than 90% of freight and passenger transport services. As a result of rapid economic transformation, over the recent past years, the Road Transport will continue to play dominant role in the Transport and Logistics sector. Fast-growing population in cities, about a third living in Addis Ababa, on the other hand, created a huge gap of suppressed demand related to inadequate urban transport services in urban areas.

The recently introduced national transport policy (March 2020), a national logistics strategy (2020 to 2030) and policy, and the transport sector's 10-year perspective plan (2020 to 2030), are striving for transport improvement charting out the way forward of the sector. Accordingly, the 10-years transport perspective plan, the country envisages to invest 3.0 trillion birr (approximately \$58 billion) in the sector in ten years. The strategy emphasized the private sector, as an engine for growth, emphasizing the need for active participation so as to achieve the goal of the development plan. So far, the role played by the private sector in the transport sector limited to providing service to public and freight transport services, freight forwarding and chartered flight services using small passenger aircrafts.

The Ethiopian transport sector is heavily dependent on public sector investment for infrastructure development in road, railway, logistics and maritime, aviation and air transport sectors. The plan identified projects, opened up for private sector investment, including dry ports and bulk terminals, logistics city development, cold chain development, freight forwarding and shipping agency services, cargo handling services at railways, maritime training institutions and maritime services. Railways development, railways operators' engagement in existing rail infrastructure, urban mass transport services, cross-country public transport services, and dry and liquid cargo transport services are focal areas for development. Expressway road development, one stop border posts, ICT development for port shipping and logistics sector development and expressway integrated traffic management system development, bus rapid transit (BRT) corridor system and cable car system development are from among other service development projects.

Overall, the Ethiopian ten years perspective plan of the country, aspires to develop a number of grand projects and programs main interventions areas and activities, as listed in the Ministry of Transport and Logistics Ten-year perspective plan, for the period between 2020 to 2030.

Table 1.1 Summary of Transport Sector Ten Year perspective plan for 2020 to 203 (MOTL),

<ul style="list-style-type: none">⇒ Increase the total road coverage of the country from the current 144,027 kms to 245,942 kms.⇒ Upgrade and strengthen the existing 28,099 km federal and regional roads.⇒ Increase the coverage of regular, and alternating road maintenance, from the current 131,596 kms to 808,662 kms.⇒ Build new long distance public bus stations to increase from the current 690 in 2020, to 732 by 2030 nationwide.⇒ Build cargo vehicle terminals to increase the number from 1 to 23, and one stop border posts from 2 to 6.⇒ Increase the number of dry ports from the current 8 to 11 by 2030.⇒ Build cold stores at studied & specified locations to increase the number from 3 (currently) to 6.⇒ Increase the urban transport infrastructures (depots, terminals, vehicle stops and parking) from 1008 currently to 2106 in 2030.⇒ Install a 25 km of cable transport (cable car) route.⇒ Build a 925 km refined fuel pipeline transport infrastructure.⇒ Increase the coverage of train infrastructures from 690 km to 3,999 km by building train infrastructure projects.⇒ Construct 3,000Km of Road for non-motorized transport services (Walking and Cycling).
Reference MoTL website : http://www.ethiotransport.gov.et/new

1.2. Road Development

The Ethiopian economy is mainly dependent on agriculture, engulfed in widespread poverty, characterized by skewed population distribution, weak spatial integration, predominance of isolated rural settlements. These are typical features of an economy calling for concerted effort in road development, to enhance economic activity, and come out from vicious circle of poverty. Road development and improvement has the potential to enhance socio-economic activities, not only

through increased use of transport services, but also improving the quality of access to productivity, markets and services. Although the level is reaching only to about 41% of the required optimal level road network to the country, the RSDP brought up remarkable road condition improvement over a series of program periods.

Figure 1.1: The Ethiopian Roads Authority (ERA) - Improvement in Road Network

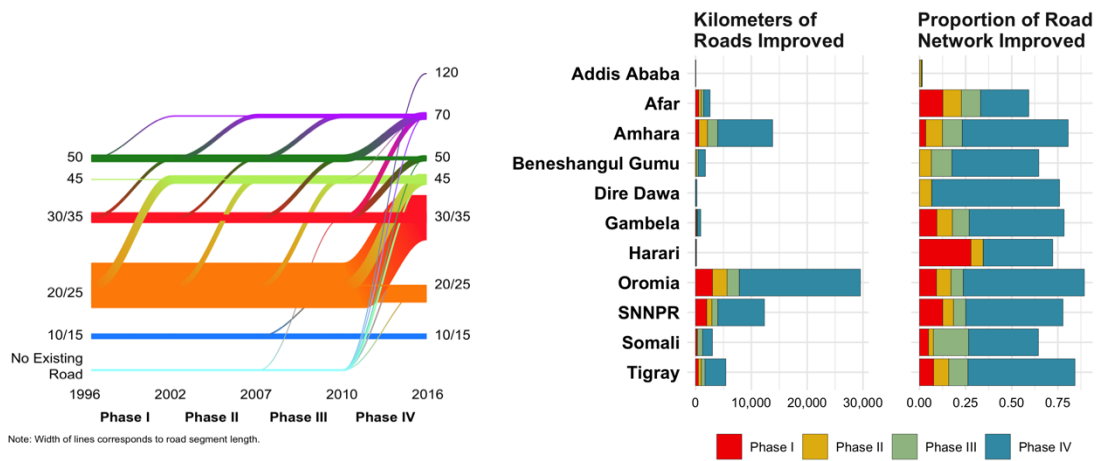


Figure 1.1.1 - Road network improvements by speed (km/h)

Figure 1.1.2 Improvement in road network by province

On the other hand, the condition of Roads in Good and Fair condition, increasing from about 20%, in 1996, to about 50% in 2021. According to “Policy Research Working Paper 10000: The Impact of Ethiopia’s Road Investment Program on Economic Development and Land Use : Evidence from Satellite Data, Overall, the program has led to notable improvements in road access.

1.3. Road Transport Services

In Ethiopia, air and rail transportation have limited modal share, and the road transport plays significant role by taking major share of the overall transportation services. Currently, the Road transport accounts for more than 95 percent of motorized inter-urban passenger transportation and freight movements in the country. It has detrimental role to play in the development of social services, import and export trade and other economic activities. However, it’s operating at high cost

of operation, with sector inefficiencies, keeping the value of products uncompetitive in the market, as well.

Road accessibility is a critical factor correlated to level of productivity, competitiveness and participation in the market, and the Road Transport service sector is having shortfalls in responding to demand. There is huge unmet supply to demand gap, which is suppressed due to low level of accessibility on road transport services. It's prevalent feature of Ethiopian transport service sector shortfall on services to get access to most important centers. It's also seen as a determining factor to ensure fast growth, and sustainable development of a country. Efficient and effective road transportation system is essential element for productivity, competitiveness and cohesion. Yet, Ethiopia has to go a long way to satisfy the need for transport, and in meeting the demand for its growing economy, and population.

According to the annual statistics of MOTAC, the total number of vehicles registered and inspected is recorded to be 145,807. In regard to motorization, the annual registration and inspection of vehicles is the main source of the national vehicle data. It indicates the volume of road worthy vehicles registered and inspected within a year. Historical trend on total number of vehicles registered and inspected for the years between 1980's to 2020 is shown in Figure 1.2 and Table 1.2 below.

Figure 1.2 – Motorized Vehicles Registered and Inspected by Region (2016-2020)

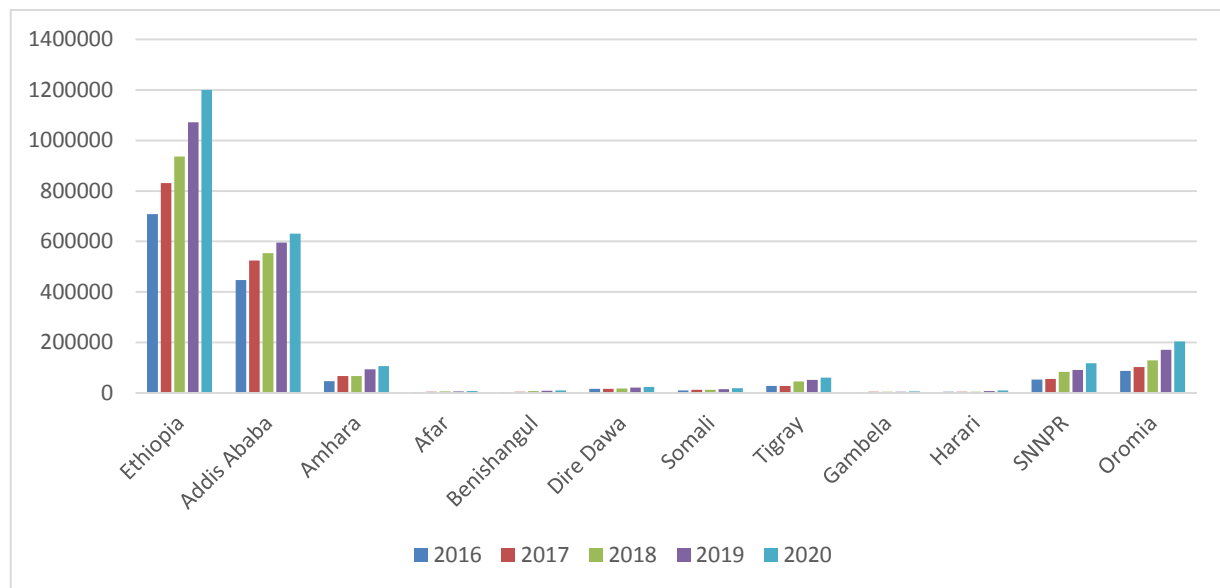


Table 1.2 - Trend of Vehicle Fleet

Year	2016	2017	2018	2019	2020	Growth Rate (%) (2016 – 2020)	Growth Rate (%) (2019 – 2020)
Ethiopia	708416	831265	935888	1071345	1200110	12	14
Addis Ababa	447669	524444	553938	596084	630440	6	9
Amhara	47036	67299	67299	94001	106434	13	23
Afar	4592	5555	6137	6598	8277	26	16
Benishangul	4600	6025	7611	8842	10655	21	23
Dire Dawa	16951	17243	17924	21938	24510	12	10
Somali	10678	13294	13294	15160	19579	29	16
Tigray	28322	28322	45925	52751	60800	15	21
Gambela	788	5122	5122	5558	6237	12	68
Harari	5643	5643	5643	8000	10728	34	17
SNNPR	54090	55985	83656	91105	118424	30	22
Oromia	88047	102333	129339	171308	204026	19	23

Source: Federal Transport Authority

1.4. Transit Transport Cost

Ethiopia's import and export trade, as a landlocked country, is mainly using Djibouti port. Djibouti corridor serves as Ethiopia's main gateway to the coast. Majority of its transit trade passing via Djibouti port using Road Transport liquid and dry cargo trucks. However, the high cost of road transport operation making trade and logistics uncompetitive, and goods and services expensive, to the local

and international market. Provision made in improving transport services, will result in reduction of overall transport cost, and travel time, which in turn will lead to increased production. As transport cost decreases, the factor prices fall and hence result in increased demand for input use, or more output supply. Road transport can further reduce production costs by lowering prices of delivered inputs, including equipment and market information.

In regard to public transport, improved transport cost promotes social cohesion and economic development by increasing mobility and improving physical access to resources and markets. Better access to roads will also improve labor force mobility, and thereby increase job creation opportunities. Investment in the transport sector can improve access, and open up economic opportunities, by reducing transport costs and travel time. If markets are reasonably competitive, this can result in lower prices for freight and passenger services, as well. This in turn can lead to lower prices for production, and consumer goods, spatial extension of the market for production, consumption goods, higher personal mobility, and a general higher level of socio-economic activities.

1.5. Railway Development

Ethiopia aspires to expand its rail network, targeting enhancement of the country's export competitiveness by significantly reducing trade logistic costs. As part of integrated surface transport plan, the country developed aggressive railways development program. It's intended to create an integrated railway network, to increase the modal share of railway to gradually shift cargo from Road based to Rail based operation. This is part of the implementation plan of a \$2 billion National Logistics Development (NLD) strategy designed to reduce trade costs and logistic hurdles. Under this strategy, priorities have been set for railway development based on the need to move commodities such as potash and coffee out of the country and import capital and consumer goods.

Currently, Ethiopia Railway's Corporation (ERC) completed a 656-kilometer railway network linking the capital city Addis Ababa to the port of Djibouti, which began commercial operations in 2018. This is a game changer to the Rail sector, as the old aged (120+ years old) Ethio-Djibouti railway line operation shift to a new line connecting the country to the port of Djibouti. Ethiopian Railways Corporation is among the main state-owned enterprises slated for partial private sector engagement or full privatization. The new Addis Ababa-Djibouti electrified railway line expected to improve Ethiopia's international import export trade by reducing the logistical costs and time of delivery.

The Addis Ababa-Modjo rail network link is the first phase of a master rail network development plan that aims to connect Modjo dry port with neighboring countries to provide access to three ports (Djibouti and Tadjoura in Djibouti, and Mombasa in Kenya). It's envisaged that the Railway service from Djibouti to Modjo (a dry port city 70 kilometers away from Addis Ababa) to reduce from 84 hours to just 10 hours. Cargo volume expected to increase to 10 million tons in the mid-term period of the plan. Cargo handling capacity on the rail network is 3,500 to 4,000 tons of freight per train, with ERC anticipating 6 to 7 million tons of cargo per year in its first few years of operation.

1.6. Summary of discussion points

The transport sector change process, from public sector dominance to more market led, has brought up enhancement to private sector driven transport sector development. The system opens up room for more private sector engagement in port and railways development, operation, maritime and logistics services, and road infrastructure development. However, the country's road development is still at its infancy, and need further improvement to respond to the growing service demand. At times, it turn out to be an impediment for productivity, and efficient response to the economy having a constraining effect to the aspiration of developing a dependable road transport system. Besides, it is also known to have

the potential to penetrate the untapped resources, for consumption and production, for fast growth and development of the economy.

Over the last three decades, the investment policies on road transport sector, however, gradually undergone through the process of radical liberalization, commercialization and deregulation of the sector and operational services. The evolution from centrally controlled to market oriented operation will be assessed qualitatively and quantitatively. As a result of weak transport and logistics responses to the economy, the loss of resources in terms of time, capital, economy and adverse social effects will be assessed. Policy reform process implications to the sector, resulting from the evolutionary process, and program interventions to stakeholders, in the transport sector will be assessed in light of the respective period policies.

Typical challenges faced by the transport and logistics sector are tied up with inadequacy of the industry to effectively, and efficiently, respond to service demand from the sector to desirable level. Common problems associated to the transport sector included high cost of transport, poor accessibility, suppressed demand, weak provision for infrastructure, high rate of traffic accidents, inefficient transport management, lack of co-ordination, absence of clearly defined transport policy and weak enforcement capacity. Analyzing the growth of Road sector development trends, problems, and measures will give bases for policy consideration and decision making calling for timely attention in the transport and logistics sector. On the other hand, due to supply side shortcomings, the number of problems and challenges we may have for them by far outweigh the number of solutions we can have.

CHAPTER TWO

2. OBJECTIVE, SCOPE AND STURCTURE OF THESIS

2.1. Background

Cognizant of the fact that Transport and Logistics has detrimental role to play to the Economy, there is strong reason and rational for having research based in-depth analysis in the context of Ethiopia. Highlighting proven interventions, as remedial measures, will help decision makers to have clear view on how to fill gaps in addressing transport and logistics related problems, weaknesses and bottlenecks inherent to the sector. It will also have timely relevance in flagging critical issues, concerns seen as bottlenecks and pitfalls. The main intention of this thesis is to conduct qualitative and quantitative analytical assessment on critical, issues and aspects determining factors of the transport and logistics sector. Basing on facts and findings, it's to lay the foundation for making informed decision, and to come-up with justifiable recommendations. It is to indicate pragmatic solutions that would bring about overall sector efficiency and respond to current problems and needs of the transport and logistics sector.

As a starting point for policy and operational consideration, the country need comprehensive assessment, and holistic look, into the logistics and transport aspects, and influencing factors. The thesis focus on analytical assessment aspects in flagging factors, problems and challenges typical to the sector. It will give timely bases to make informed decision for having balanced, and cost effective, development programs to consider in the working system. Such assessment should be based on in-hand information, and expertise gained from practical exposure and experience in the sector, paving way in making pragmatic decisions. It will help to seamlessly develop cost-effective transport and logistics solutions to help decision makers make informed decision. Overall,

the thesis assessment will through some light, based on available base data and information, and private inputs for informed decision making on the logistics and transport operation of the country.

2.2. Approach and Methodology

Based on findings of the six key assessment areas, the main approach of thesis is to make analytical work to come up with findings and draw conclusions. Thesis methodology is based on qualitative assessment and quantitative analysis which is based on secondary data bases gathered from various sources. Methodology followed for the thesis give respective bases generalization on core areas of the transport and logistics of the country. It's based on existing practices, research findings, review of references material, surveys and lessons learned from elsewhere. Review of literature, analytical assessment of data and information, as parts of thesis methodology, extensively used in drawing summary of conclusions and recommendations, and presented diagnostics analysis on:-

- i. an overall assessment and review of the road infrastructure, financing and asset value-based data and information, from the Ethiopian Roads Authority (ERA), Regional Rural Road Authority's (RRA's), Ethiopian Road Fund Administration Office (ERFAO) collected and analyzed;*
- ii. overall assessment on vehicle statistics, performance reports of transport industry, and operators' data sourced from the Ministry of Transport and Logistics (Former Ministry of Transport), former Federal Transport Authority, Regional Transport Bureaus (RTB's), and Transport operator companies and associations;*

- iii. *review of road transport and logistics studies, reports and documents that are related to topics of the thesis, including study documents and maps;*
- iv. *analysis and presentation on historic data and information as compiled by agencies operating under the Ministry of Transport and Logistics, private sector, Ministry of Trade, Customs Authorities, and Transit operators, etc.*
- v. *discussion points, and operational policy issues, presented towards the end of thesis with summary of findings and recommendations related to the respective topical areas;*
- vi. *following standard presentation format and statistical methods, analytical results of thesis presented in structurally readable format, in making it more meaningful and takes shape of understandably readable format.*

2.3. OBJECTIVE OF THESIS

2.3.1. General Objective

General objective of thesis is to discuss and present the situation of Ethiopian Transport and Logistics sector in terms of the evolving trends, problems, policy issues, concerns, potentials and prospects for the future. The thesis intends to come up with qualitative assessment, and quantitative analysis, in describing aspects of Road, Transport, Urban Transport and Logistics sector of the country. It's come up with findings, conclusion, and summary recommendations useful for policy decision making, regulatory and operational considerations. The thesis undertook an in-depth synthesis and analytical, assessment of existing practices, trends problems, and challenges seen on and diagnostic situation of the sector. Following analytical assessment, the work expanded to drawing

lessons learned in the respective sections as summary of recommendations including the general objective points of :-

- *To evaluate the physical performance capacity of the country's fleet, in general, and freight transport in particular,*
- *To identify weaknesses and bottlenecks of the system in responding to the demand for transport and logistics operation,*
- *Present and draw lessons learned from elsewhere, on general and specific conditions of Transport and Logistics sector in the country,*
- *To come up with assessment-based conclusions and recommendations, as points of summary, for consideration,*

2.3.2. Specific Objectives

Specific objectives of thesis is to make detailed analytical assessment, both qualitative and quantitative, on factors and elements of the Road, Transport and Logistics sector. By way of discussing evolving trends, problems, policy and regulatory issues, and prospects, the thesis makes diagnostics assessment of existing situation and future prospects of the sector and to come up with pragmatic recommendations. The specific objective of thesis will thus be focusing on critical elements related to:

- *Road Infrastructure development, trends situation analysis and its management;*
- *Aspects of Road Financing, Road Fund and Road Asset Management;*
- *Road transport service sector capacity, and needs assessment;*
- *Assessment of the Urban Transport and Mobility situation of the country, in cities and urban areas;*
- *Situation analysis of the Logistics and Transit service sector of the economy;*
- *Present and draw lessons learned from elsewhere, on general and specific conditions of Transport and Logistics sector in the country.*

2.4. SCOPE OF WORK

The scope of work extends over the six critical key areas and facts identified for qualitative and analytical assessment on Ethiopian Transport and Logistics sector. Scope of work for the thesis is based on availability of secondary data bases, review of studies available and research work authors long term engagement, practical exposure from hands-on sector experience, supported by various program management and project deliverable reports. As part of thesis work, a great deal of effort laid off in gathering research base information from historic working documents, reference materials and study documents discussing the various aspects of Road, Transport and Logistics system of Ethiopia. The thesis identified six key areas for analytical research work, and the six core chapters grouped :-

- i. **Descriptive assessment on the Development of Road Infrastructure (Chapter 3):** The scope of research work reviewed secondary data-based information. Road stock data, trends showing growth, and condition analysis, conducted based on available road data and Road condition information as gathered from reports and documents. Presenting in analytically presentable format, the storyline of the Road Infrastructure development process of the sector presented in a meaningful format, road maps, graphs and road related transport and logistics findings of the research assessment;*
- ii. **Analytical assessment on the Road Asset Management of Ethiopia (Chapter 4):** Road Infrastructure development program results, following the analysis of the preceding chapter, the thesis proceeded to assessment of the Road Asset management practices and valuation of the Road asset of the country by emphasizing high value of road asset of the country.. It's in a way trying to give appreciation on the benefits of Road Asset management practices. Models applied for evaluation*

and results obtained, analyzed and presentation is made on the road asset value assessment results of the road sector. It is a section bridging research analysis to the next section which is linked to Road Financing and Road Fund management of Ethiopia.

- iii. **Diagnostics assessment of Road Fund Management in Ethiopia (Chapter 5):** Scope of work focus on analytical assessment of Road financing, in general, and the evolution of Ethiopian Road Fund in particular. Due reference is given to the process of establishing the road fund, from its inception to realization, and practices of operational management of the fund. The concept framework of the road Financing and Management discussed and presented. Proven findings on the road financing system, giving value for money, analyzed as part of the principles of commercial management and financing of the road sector;
- iv. **Road Transport services capacity and utilization assessment (Chapter 6):** Scope of work in this chapter mainly describing status of motorization and statistical trends of motor vehicle fleet growth in the country. It's followed by utilization trend analysis and performance evaluation of the road transport service sector. Particular emphasis is given to operating condition of freight and passenger vehicles in highlighting the transport industry. It's in a way to analyze gaps and problems faced by the logistics capacity and transit sector in light of service demand from the sector;
- v. **Assessment on the Urban Transport and Mobility situation of the country (Chapter 7):** Diagnostics assessment on the Urban Transport and Mobility situation of the country presented on status of existing conditions, evolving trends and new development scenarios. Qualitative assessment of the urban transport situation, policy and regulatory framework, and prospects presented based on findings and results from urban transport related research findings and studies. As

its main focus area, the scope of work will have descriptive analysis of the existing operation, and modalities, in particular focusing on the case of Addis Ababa;

- vi. **Assessment on aspects of Logistics and Transit trade in Ethiopia (Chapter 8):** *Scope of work will look at logistics service provisions, supply chain assessment, cargo handling capacity, transit and cost structure of the logistics and trade system of the country. Prospects and potentials for the way forward of the transport and logistics sector described based on analytical findings and assessment results of thesis. Ethiopian Import and Export trade balance analyzed to see the impact to transit trade and logistics aspects of the sector. In particular, the Ethio-Djibouti corridor, as main gateway to the coast, will thoroughly be analyzed to show gaps and cost implication for transport and trade competitiveness.*

2.4.1. Source of information and data

The main sources of information are secondary data bases, gathered from relevant institutions, and operating agencies engaged in the course of discharging their responsibilities. From the start, the thesis gathered relevant information, reviewed relevant study documents, interviewed and consulted renowned experts of the sector based on objective direction of thesis. The primary task of data collection, data cleaning, preliminary assessment followed by quantitative analysis. The data and relevant information, gathered from official and unofficial sources, and source information involving author's direct engagement in the sector, compiled, analyzed and reviewed in the course of assessment for subsequent chapter presentations. Statistical validation and adjustments made on missing data values to fill the gap for the analysis.

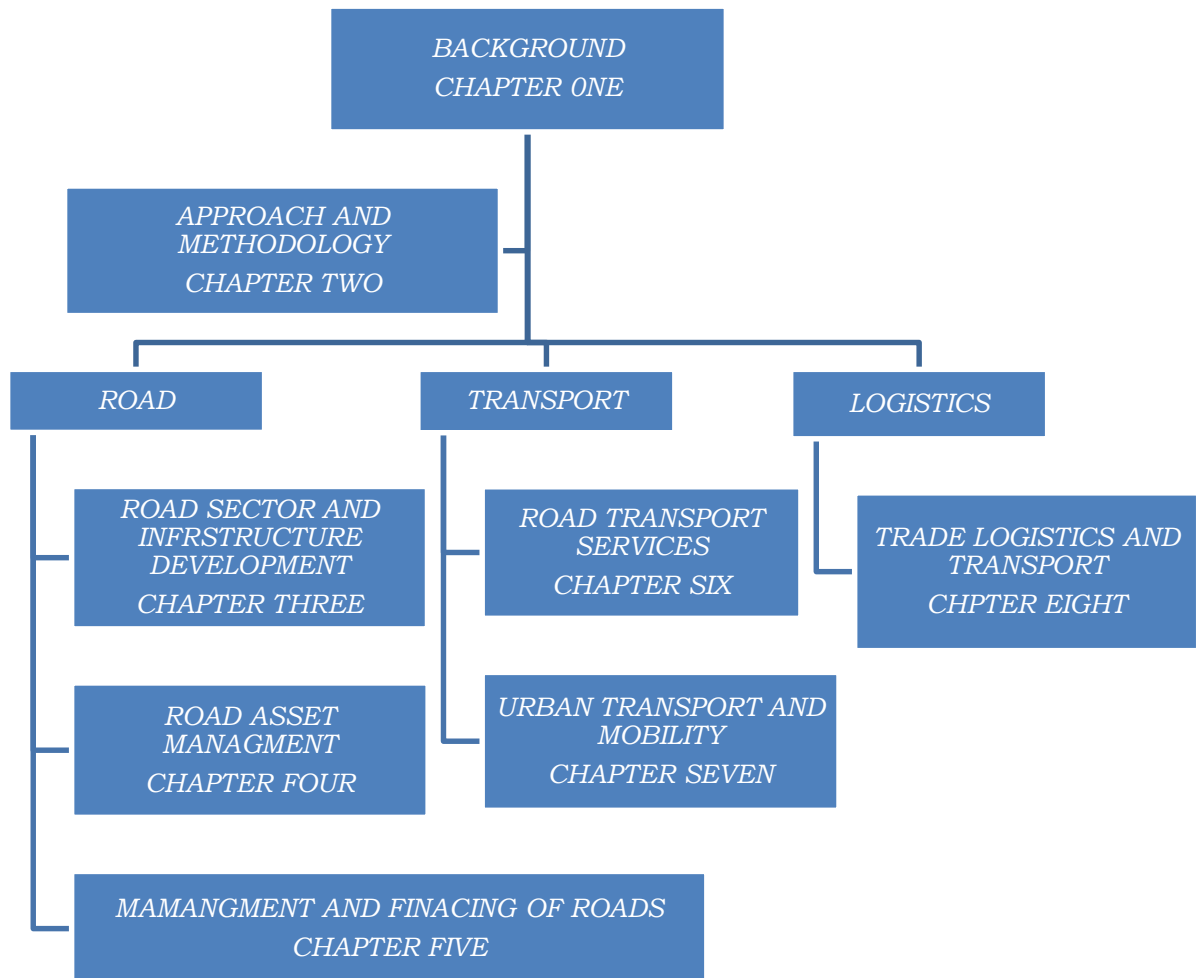
However, it's to be noted that, in the course of assessment, there has been a number of constraints and limiting factors related to absence of reliable official data base for direct use of thesis. On the other hand, as a challenge, inadequacy of findings to give firm bases for immediate use by recipients observed. This may otherwise require backing up by proxy information and other base sources. There has been problem of probable incompatibility to other study findings, due to variable norms and practices in the context of varying working conditions, rules and regulations. Qualitative expert judgment, knowledge and experience-based adjustments made on technical aspects and typical sector issues. Problem associated with inconsistency, on the secondary data base, and unreliability for some of the information provided properly addressed without loss of generality.

Thesis sections gave due attention to synthesis and analytical translation of data and information gathered to make it more meaningful. Efforts laid off in gathering useful data and rich information giving adequate bases for thesis assessment on the sector in the process including : -

- Gather, organize to compile secondary data base, and convert it to useable format, by applying scientific methods as appropriate tools for the analysis,*
- Interviewing of major users, sector experts, stakeholders and partners of the sector operation,*
- Collection of qualitative information, historical documents and reading material on sector issues, used as an impetus to enrich thesis assessment bases, findings and recommendation,*
- Discuss various topics, collect views, and opinions from regulatory and operating bodies, and through use of well-established networks for general observation on the subject;*

- *Review relevant studies and documents available, summarize and present analytical findings and recommendations, inline to the scope and structure of thesis;*
- *Evaluate and assess lessons learned from performance of other operating bodies, against international standards, from elsewhere, and acceptable norms developed for comparative analysis on the subject.*

2.5. Structure of Thesis Presentation



CHAPTER THREE

3. DEVELOPMENT OF ROAD INFRASTRUCTURE

3.1. Evolution of Ethiopian Roads

Historical development of Ethiopian Roads dates back to the reign of Menelik, when the first road link between Addis Ababa and Menagesha (Holeta) was built. Evolutionary development phases could broadly be grouped into periods of pre-colonial, colonial invasion period, post-colonial period of the imperial regime, the Derg regime and the current regime. Development of the road infrastructure, during the respective eras, typically manifesting the socio-political interest and prevailing economic policies of the respective regimes. For instance, during the Italian invasion period, Roads were built with the prime interest of colonial expansionist strategy and marked drastic network growth in the history of Ethiopian road sector.

During the five years colonial invasion period, the Italians constructed close to 6000 k.m roads radiating from Addis Ababa in all directions. The roads traverse through difficult terrain and geographic condition, which enabled them to access strategic locations with road network connectivity in the country. The road design and construction engineering are known to have sharp curves, passing through the difficult terrain and topography of the country. Design concepts of road construction and alignments of designs are signs of the then remarkable engineering design advancement. They have recorded long years of service, beyond their design life, and notably on bridge design and tunnels. Some of the road alignments, radiating from Addis Ababa, are still following same Italian built alignments. However, the bridge structures gradually changing, and road re-alignments are taking place as part of the road improvement program of the country.

Road construction, in Ethiopia, counts seventy-five years of implementation under series of Road development programs. The Ethiopian Imperial Highway (the current Ethiopian Road Administration) established in 1952; during the post-colonial period of Emperor Hailesellasié. The IHA formulated and executed about seven major phases of Road development programs and praised for its known track record of constructing the country roads. For many years, the majority of roads were constructed by force account, and road maintenance was the sole responsibility of the Authority. Most of the road programs were implemented on a piecemeal bases; i.e., mainly targeting on specific road segment packages of road construction and maintenance. In line to respective responsibilities vested in it, the authority undergone through a number of reform programs in implementing program based strategic interventions. Following the prevailing socio-economic conditions of the political systems, the Authority reformed and named as IHA, ETCA, ERA, Ethiopian Road Authority and currently Ethiopian Road Administration.

Over the period between 1952 and 2006, the authority road stock increased from about 6000 km to about 38,000 k.m. During this period, the construction of roads recorded high range average increment of about 600 k.m. per year. Road network during Derg regime recorded the construction of 9757 k.m. of Roads built between 1974 and 1991, which showed annual increase of 6.2%, or 540 k.m. per year. During the Derg era, focus of road construction was on rural roads, and less emphasis given to need for road maintenance. As a result, the stock of rural roads increasing from 120 k.m to 5610 k.m, and the rural road share growing from about 2% to about 30% over the year periods. Road building during this time fully managed by the public sector making use of the force account of ERA/ETCA for construction and maintenance.

Following the downfall of the dreg regime, an emergency rehabilitation program (ERP) initiated to rehabilitate the vastly devastated roads due to protracted war in the country. The primary target of the ERP focusing on clearing of arrears with

backlog of road maintenance and rehabilitation work. It turn out to be an impediment to the development program and the expected backing up of the Road Transport system to the economy. Most roads were going from bad to worse condirtion and hence the state of roads increasing the cost of transport. At the startup phase of the program, the roads in good condition were only 21% for asphalt, 25% for gravel and 17% for rural road network. ERP implementation started with selected link roads with design and build approach, as selectively aligned strategic turnkey road projects. The design and build approach applied for links and contracted out to private contractors in a way to build their capacity. It has built in interest of building the local capacity of private contractors to keep them competitive so as they will be joining the construction industry, and hence strengthen their capacity to be competitive.

3.2. Road Sector Development

Considering bad state of the road network, which was an obstacle for growth and development plans, the Ethiopian government implemented ambitious development plan of road transport programs starting from early years of 1990's. Cognizant of prevailing problems, as faced for over three decades, the country gave greater emphasis to improvements on the main road network, and extending the regional network, to meet the socio-economic development needs of the country. Accordingly, the Government of Ethiopia, following ERP, launched the Road sector Development Program (RSDP) in 1997 (RSDP Phase-1, 1997-2007). RSDP is a comprehensively integrated program containing components of civil works, policy and institutional reform actions and programs to the road sector. The program intends to bring about improvements to the road transport to develop dependable system to satisfy the need for public and goods transported.

The rugged terrain and topography of the country, coupled with the spatial distribution of the population, keeps the cost of Road construction and transport to be high. Ethiopia by then had one of the lowest road densities in the world, which

was by far below the average for other African countries. Ethiopia, as of 2022, has a total classified road network of about 28,000 km, with road density level of about 4.2 km per 10,000 people, and 23 km per 1000 square km of the total land area. The RSDP launched in order to have enabling condition to penetrate the untapped potential resource areas of the country. It's also to have better agricultural productivity, improvements on market condition, access to social facilities, land utilization and sustainability in creating dependable transport system.

As part of broad-based road development strategy, the road network expansion has been done by upgrading, and reconstructing link roads, to address the deficiencies in accessing the economic potential of the country and meeting the social needs. In addition to huge resources outlaid, there has been concerted efforts laid off to create adequate capacity in the road sub-sector so as to facilitate, and hasten the economic recovery process, and restore the essential road networks to an acceptable condition. It was expected that the huge outlay of investment dramatically improved the classified road network, connecting different regions of the country, and low-class roads interconnecting rural villages.

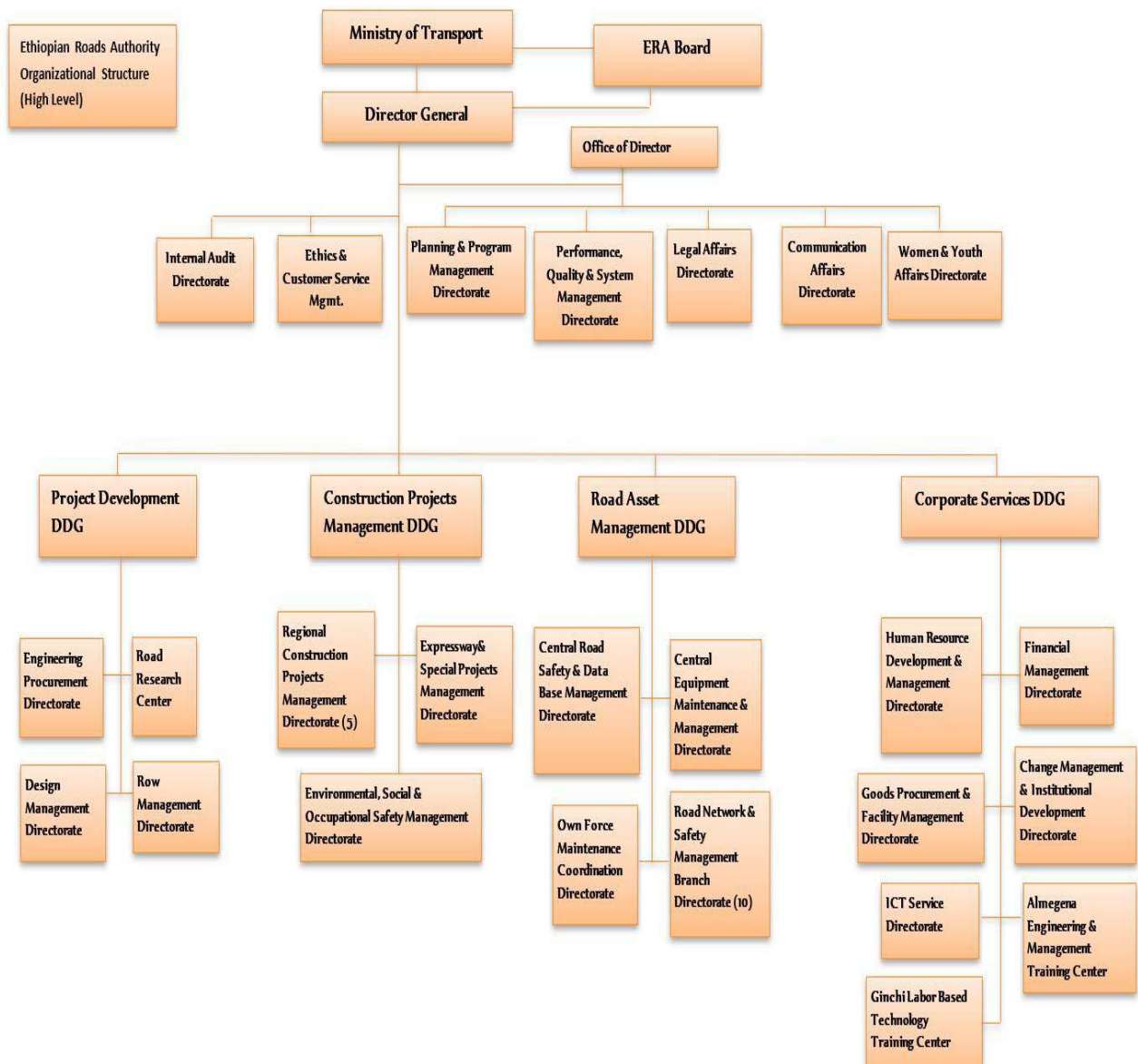
Over the period of three decades, it has been recorded that the stock of the country's road network showed dramatic increase, and also remarkable quality improvement on roads. For instance, starting from early years of the 90s, Ethiopia's classified road network by then was limited to about 23,000 kilometers, and currently reaching to a record stock level of 145,000 kms. Regarding condition of roads, during the respective period, the proportion of poor road network reducing from about 75 percent to about 50 percent in 2022. The Road Infrastructure achievement, in the context of the five phases of the sector program, therefore, require thorough evaluation to ascertain the success story of Ethiopian Road Sector development, which is one of the primary objective of this thesis.

3.3. Road Sector Institutional Setup

The Ethiopian Road Authority (ERA), currently named as Ethiopian Road Administration (ERA), is a government body in charge of the overall responsibility

for Road planning, development, and maintenance of the national road network. Following the respective period of regime policy changes, ERA, which was established in 1951, had gone through a number of reorganizational, and reform processes. ERA is responsible for road construction, monitoring and the maintenance of trunk and major link roads, as well supporting the country's infrastructure project development programs. ERA is accountable to the Ministry of Works and Urban Development and have appointed oversight board of Directors.

Figure 3.1: Existing ERA Organizational structural



3.4. Road Classification

Road Functional classification indicates the functional usage of a particular segment of a roadway in serving the common flow of traffic using the network. Based on the character of travel service, the country roads are assigned to a hierarchy of Road functional classification. The Road classification system of Ethiopia, shown in table below, highlighted the ownership, management, class and surface type established for the country roads. Broadly, the first three Road Classes (Expressway, Trunk and Link) are federal roads under the Ethiopian Roads Authority. Regional roads consist of roads under Regional Road Authorities and Urban roads, under Municipalities. Other road facilities, such as those roads under universal road access program (URAP), are under the responsibility and jurisdictions of the corresponding Woredas of the regions. Municipalities are meant to administer all types of road network under their jurisdiction.

Table 3.1: Road Class Administrative Setup

Road Class	Administration	Surface Type	Road Hierarchy
Expressway	Ethiopian Road	Asphalt	Primary
Trunk	Administration (ERA)	Asphalt	
Link		Asphalt/Gravel	
Main Access	Regional Road	Gravel	Territory
Collector	Authorities (RRAs)	Gravel	
Feeder	Woredas	Gravel	Community
Urban	Municipalities	Asphalt/Gravel	Primary/Secondary/Tertiary

Source: ERA RFCS

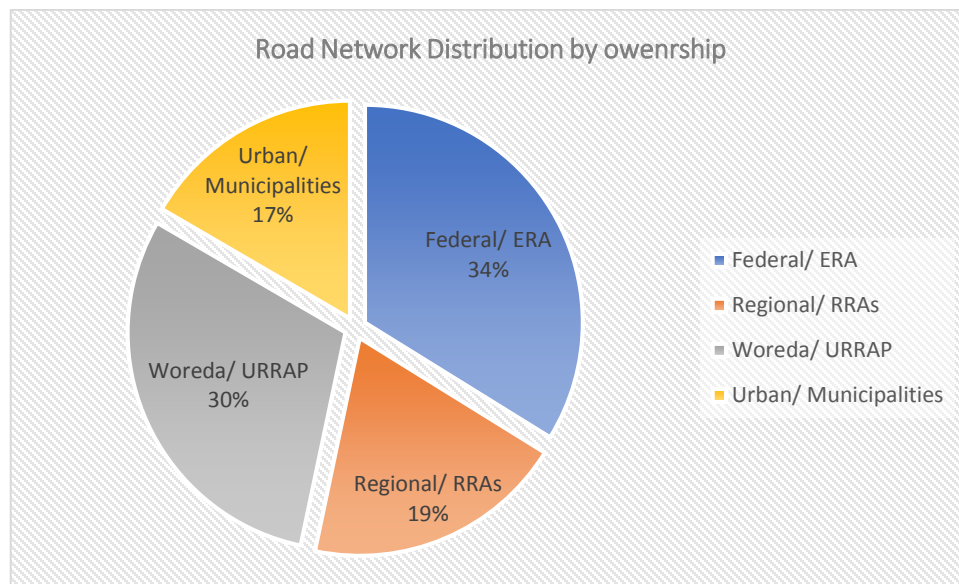
3.5. Management and Ownership of Roads

According to data collected from ERA, RRAs, Ministry of Urban Development and Construction, the total volume of Federal, Regional and Municipal roads network and distribution is summarized in below. Currently, the total stock of road network is 144,000 kilometers; out of which about 20 percent administered by the Federal

Government through Ethiopian Roads Authority; 25 percent by the Regional Roads Authorities; and 16 percent by Municipalities including Addis Ababa City. The remaining classified as Woreda/URRAP/ roads containing low volume traffic roads.

Figure 3.2: Road Network Distribution

1.



3.5.1 Federal Road Network

The Ethiopian Roads Authority (ERA) is responsible for the management of 28,699 km of national roads administered under jurisdiction of the federal government. Currently, it is recorded that 15,886 km (55.4%) are asphalt roads and 12,813 km (44.6%) were gravel roads. Out of which about 40% (6,355 km) of asphalt roads are Double Bituminous Surface Treatment (DBST), and the remaining 60% (9,531 km) of the roads are Asphalt/ Cement Concrete (AC). Studies by HITCON and DANA Consultants generally showed that the respective conditions of paved roads in the Country are: 18% good, 37% fair, 27% poor and 18% very poor, and conditions of unpaved roads were 13% good, 48% fair, 23% poor and 16% very poor.

Figure 3.3: Road Condition Percentage shares

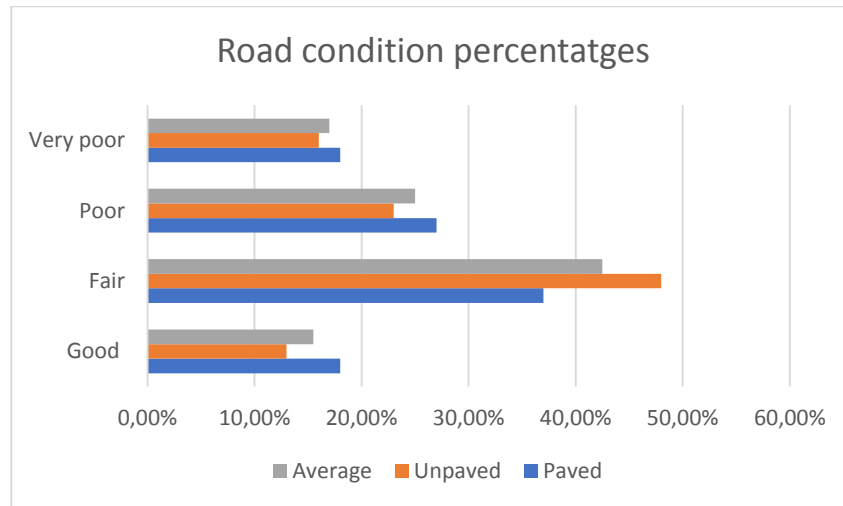


Figure 3.4: Federal Road Network by Surface Conditions

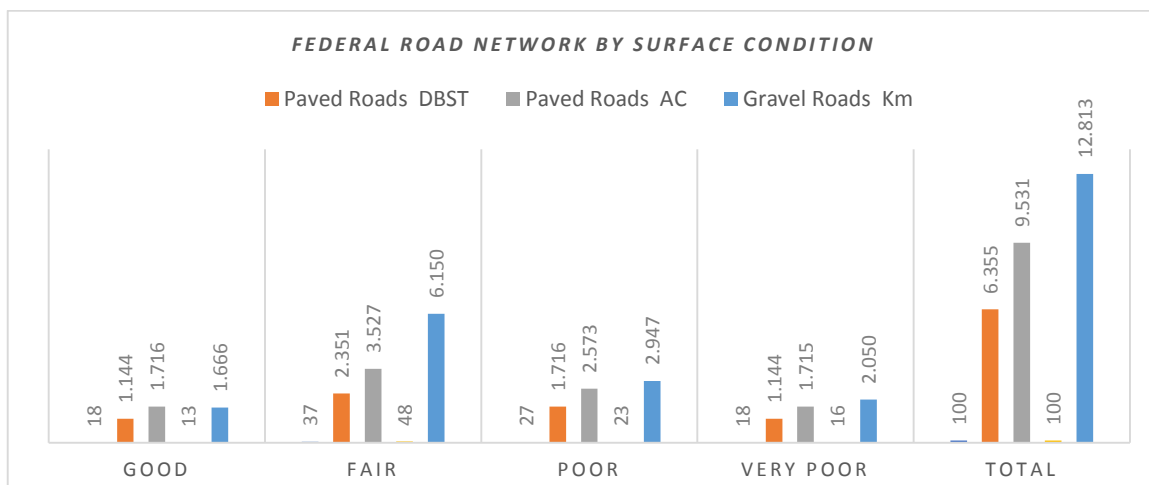


Table 3.2: Federal Road Network by Surface Conditions

	Paved Roads			Gravel Roads		Total	
	%	DBST	AC	%	Km	%	km
Good	18	1,144	1,716	13	1,666	16	4526
Fair	37	2,351	3,527	48	6,150	42	12028
Poor	27	1,716	2,573	23	2,947	25	7236
Very Poor	18	1,144	1,715	16	2,050	17	4909
Total	100	6,355	9,531	100	12,813	100	28699

Source: ERA and Consultants Estimate (Studies by HITCON and DANA Consultants)

The costs required for paved and gravel roads improvement, and maintenance costs, sourced from budgeted investment of Ethiopian Roads Authority (ERA). It's estimated that less than 20% of the federal road network is currently in good condition, which shows current maintenance intervention level is far below the required standard. As part of the long-term plan, all federal gravel roads assumed to be upgraded to asphalt standard. However, in the coming 10 years period, only 6600 km of roads planned to be upgraded and about 5000 km of new asphalt Federal roads will be constructed between 2021 and 2030.

3.5.2 Regional Roads

There are 35,806 km of regional roads, out of which 10,740 km (30%) are in good condition, 7,160 km (20%) in fair condition, 3,510 km (10%) in poor condition and the remaining 14,396 km i.e. (40%) in very poor condition. It is assumed that routine maintenance of regional roads is performed with minimum budget and allocation are inadequate to fill the budget gaps. The road fund allocative practice for routine maintenance unit costs of regional roads budgeted to cost only half the costs of Federal roads. Similarly, the upgrading costs of regional roads estimated to cost half the cost of Federal Roads. It's also assumed that an additional 2,000 km of new regional roads will be constructed over the period between 2021 and 2030.

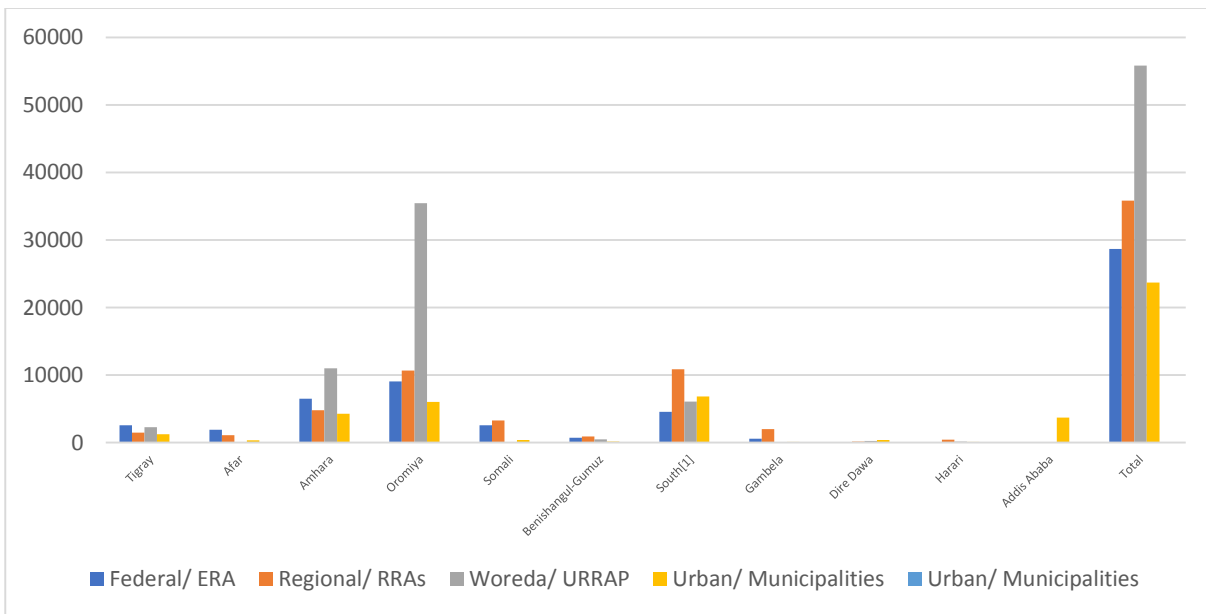
Table 3.3: Road Network (by Regions and Road Agencies)

No	Region Name	Length of Road Network (in Km)				
		Federal/ ERA	Regional / RRAs	Woreda/ URRAP	Urban/ Municipalities	Total
1	Tigray	2588	1490	2302	1271	7651
2	Afar	1916	1124		354	3394
3	Amhara	6502	4786	11000	4305	26593
4	Oromiya	9081	10656	35460	6042	61239
5	Somali	2586	3305		415	6306
6	Benishangul-Gumuz	735	936	519	155	2345

7	South ¹	4592	10866	6070	6860	28388
8	Gambela	602	2027	33	133	2795
9	Dire Dawa	45	161	280	380	866
10	Harari	52	455	144	101	752
11	Addis Ababa				3699	3699
	Total	28,699	35,806	55,808	23,715	144,028
	Percentage	20	25	39	16	100

Source: Compiled and summarized under Federal Road Network Master Plan study, 2020

Figure 3.5: Road Network by Regions and ownership



3.5.3 URRAP/Community Roads

With carriageway width of 4.5 meter, there are 55,808 km of URRAP roads in the country. It is assumed that the maintenance cost of URRAP roads will be half of the maintenance costs of regional roads which means one-quarter of the Federal roads (Birr 183,724/km). This is with the assumption of keeping at minimum intervention level, and the adequate costs estimated at Birr 275,585/km). Accordingly, one-quarter of these become Birr 45,931/km in the case of minimum maintenance and Birr 68,896/km in the case of adequate maintenance. In terms of traffic usage, the

three types of vehicles operating on URRAP roads are: 4 WD (40%); Small Bus (30%) and Small Truck (30%). It's also taken to have Average annual daily traffic (AADT) of 50 vehicles.

3.5.4 Urban / Municipal Roads

The total length of urban roads in Ethiopia is about 23,715 km, out of which 3,699 km is in Addis Ababa and the remaining 20,016 km are in other urban areas of the Country. In these urban areas, there are 1,500 km of asphalt roads and the remaining 18,516 km are cobble stone, gravel and service to traffic roads. Out of the 3,699 km of roads in Addis Ababa, about 1,713 km are paved. The surface conditions of these roads assessed as 736 km (50%) good, 442 km (30%) fair; and 295 km (20%) poor and very poor. Surface conditions of gravel roads with about 50% good, 30% fair; and 20% poor and very poor. The construction cost of new asphalt road is estimated at about Birr 25 million per km (USD 0.5 Million).

3.6 Road Sector Plan and Financing

The Ethiopian Roads Authority, in 1997, embarked on an ambitious road sector development program calling for financial mobilization towards road sector infrastructure development. It's meant to reduce the cost of transport, and travel time, by reducing the distance through improved road connectivity. During the five phases of RSDP, the program traversed 25 years of implementation over the period between 1997 and 2021. It was launched with the intention of road improvement programs, including the clearance the huge backlog of mobilizing huge resource for road improvement programs, including clearance of huge backlog of maintenance work, and to improve road access within and between regions.

Over the past 25 years of the program period, the physical and financial performance of RSDP against its plan is recorded to achieve 65% and 80% respectively. Road sector development finance record shows an investment outlay of approximately Birr 415 billion for road development programs and activities

covering 159,000 km of roads. The investment included the maintenance work required for works and series of activities for rehabilitation, reconstruction, periodic and routine maintenance intervention on major roads.

It is important to note that the RSDP set out a clear strategic direction for the restoration and expansion of Ethiopia's road network. RSDP has massively improved the performance of the sector in terms of strengthening Road Agencies and their management, as well. For instance, the establishment of the Road Fund, and its administration, contributed a lot for improvement on quality of road network. It's creating favorable condition to the domestic construction industry and introduced radical measures of off-budget financial arrangements for road maintenance, and road safety work of the sector.

3.7 Road Network Investment

With regards to the supply side of road network, there is huge gap of meeting the need for road transport expansion and hence growing road demand in the country. It's manifested by huge disparities on spatial distribution as reflected on expansion coverage to the vast majority of the rural land area. It's still short of meeting the demand for socio-economic activity needed, especially in terms of reaching out the untapped resource rich potential areas of the country. As a result, the nation faced a daunting challenge in delivering the need for road infrastructure required to sustain the momentum of economic growth and societal development.

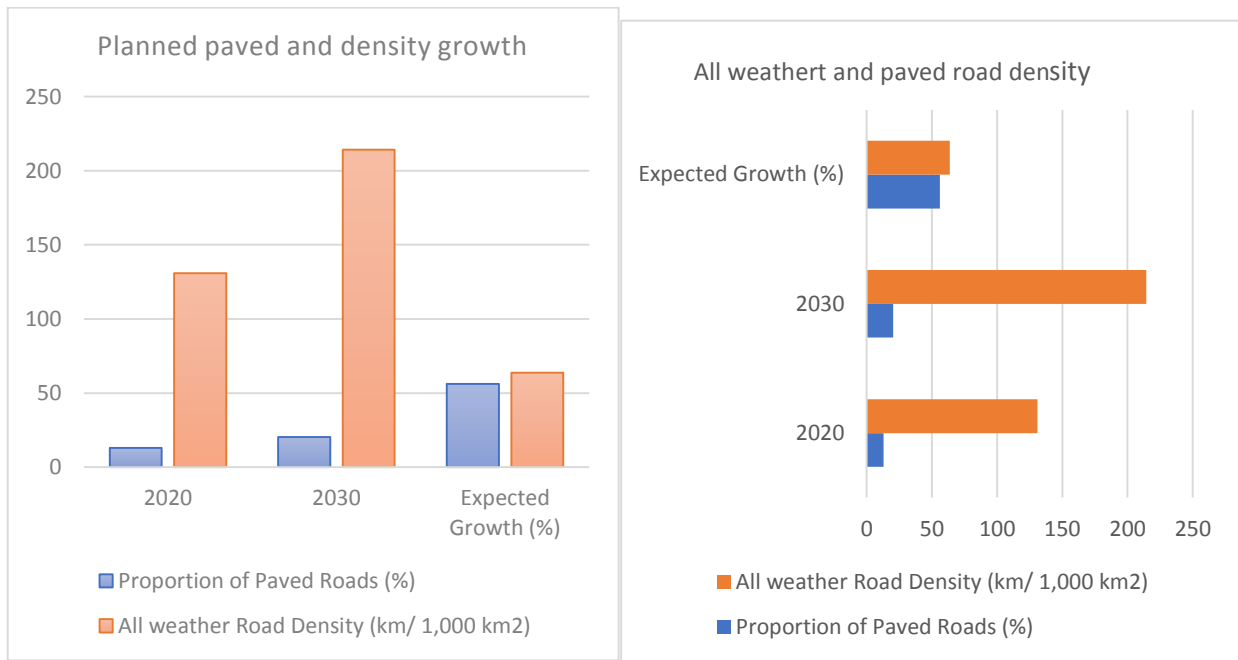
In addressing the issue, the ERA prepared a comprehensively integrated Federal Road Network Master Plan placing infrastructure as a prime mover to achieve economic goals, investment required, and identifies goals over the next 10 years and beyond. The plan envisages the road network to grow by about 70% to reach about 246,000 km by 2030. It's aggressive and optimistic as it brings huge increase to the stock of the country road network. If achieved, the result will also have significant impact to raising measures of Road density and distribution levels. The projected road composition data is shown on Table & Graph below.

Table 3.4: Total Projected Road Network

Indicator	2020	2030	Expected Growth (%)
All weather road Network (km)	144,028	245,942	70.8
Total Federal Road Network (km)	28,699	46,119	60.7
Proportion of Paved Roads (%)	13.0	20.3	56.2
All weather Road Density (km/ 1,000 km ²)	130.9	214.3	63.7

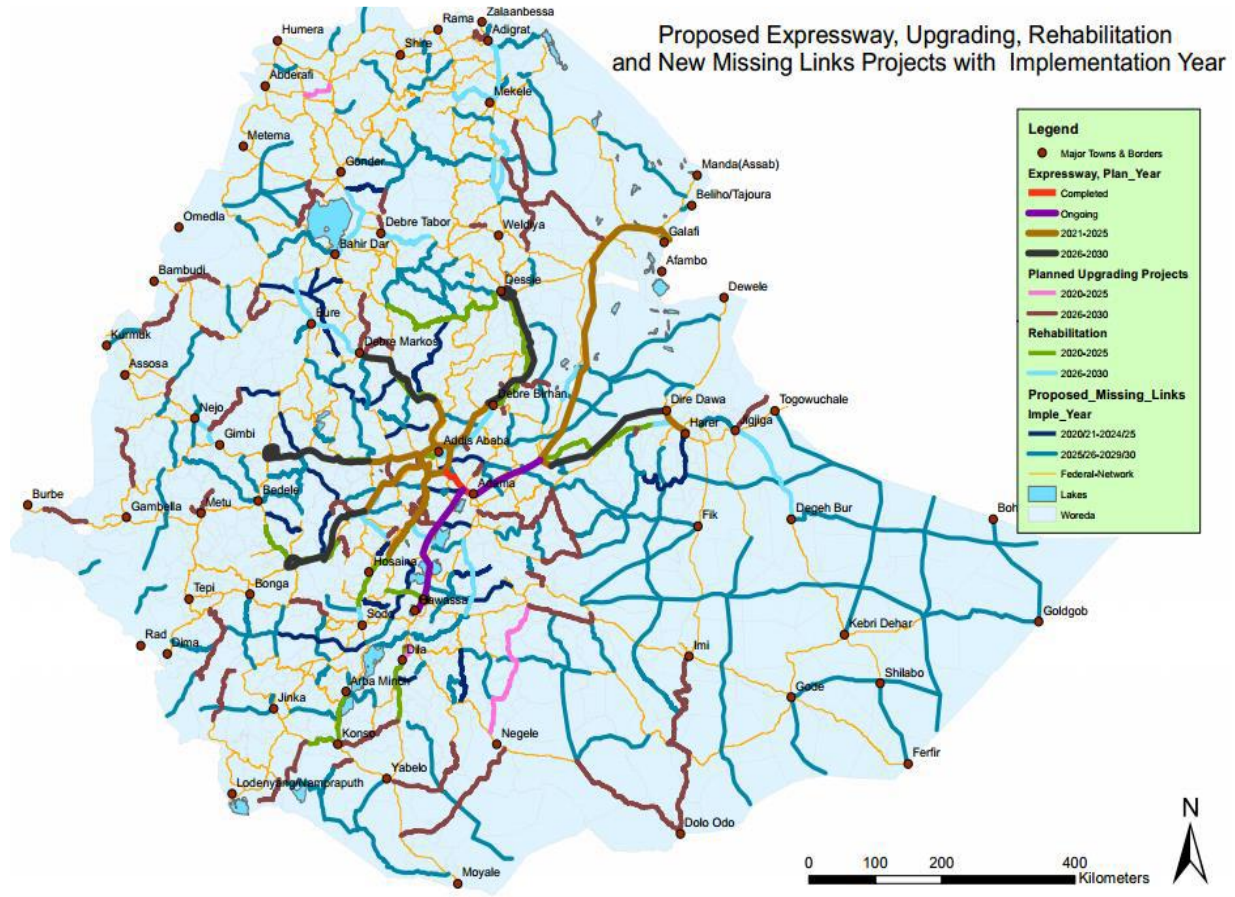
Source: ERA Federal Road Network Master Plan study, August 2020

Figure 3.5: Road Network Projection



The map below depicts the road network expansion, proposed expressways, upgrading and rehabilitation works and missing links projected for implementation during the periods up to 2030. Huge investment requirement in the range of Birr 1.4 trillion (equivalent to USD 28 billion) required to implement the selected projects over the ten-year period.

Map 3.1: Map on Proposed Intervention (2021-2030)



Source: ERA Federal Road Network Master Plan study, August 2020

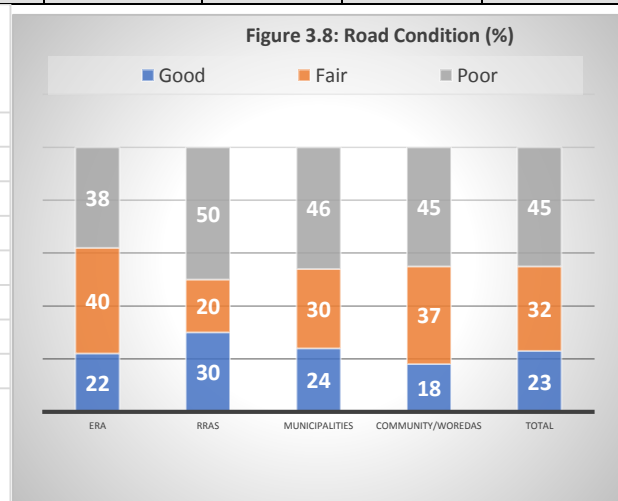
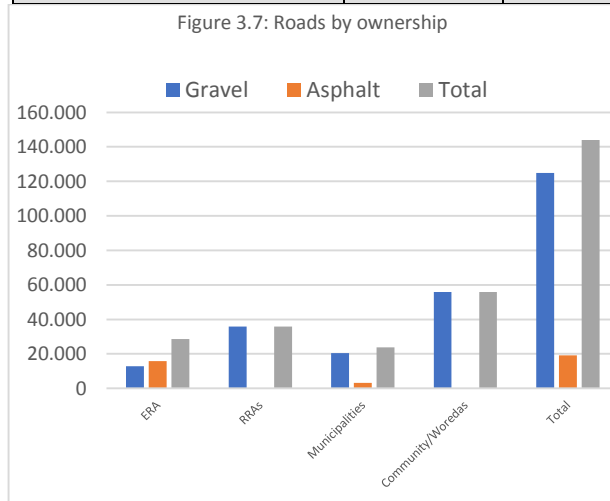
However, this is exclusively for federal road network, set as capital budget, and excludes the required budget for maintenance and up-keeping of the whole network; i.e., excludes the cost of construction, upgrading and rehabilitation of regional, urban and woreda roads, studies and capacity building components for the sector. It's taking significant amount of the countries national budget which will range from 15 to 25 percent, if achieved, clearly show the emphasis given to the road sector. The government allocation takes more than half of the federal budget (55 per cent) which goes to pro-poor sectors; education, health, road construction, water and energy, and agriculture. For instance, the share of road sector allocation for 2021/22 is 19.5 per cent for road construction.

3.8 Road Condition

Over the program period of RSDP phases, the roads in fair and good condition improvement level showed significant increase. As a sign of success on program improvement, it is estimated to have more than 50% of roads in good and fair conditions. However, there are still 33,126 km (23%), fair condition 46,089 km (32%), and the 64,812 km (45%) are in poor condition. Putting several sources together the nation’s road network need major intervention in maintenance and up-keeping works with only 55 per cent of the network in acceptable “good to fair” condition of roads. This disparity partly reflects inadequate financing, poor planning, unstable flow of funding. It’s partly also related to inadequate capacity of the responsible bodies for road maintenance.

Table 3.5: Surface Type and Road Condition

Administration	Surface Type (in km)			Road Condition (in %)		
	Gravel	Asphalt	Total	Good	Fair	Poor
ERA	12,813	15886	28699	22	40	38
RRAs	35,806		35,806	30	20	50
Municipalities	20,502	3213	23,715	24	30	46
Community/ Woredas	55,808		55,808	18	37	45
Total	124,929	19099	144,028	23	32	45
	87%	13%				

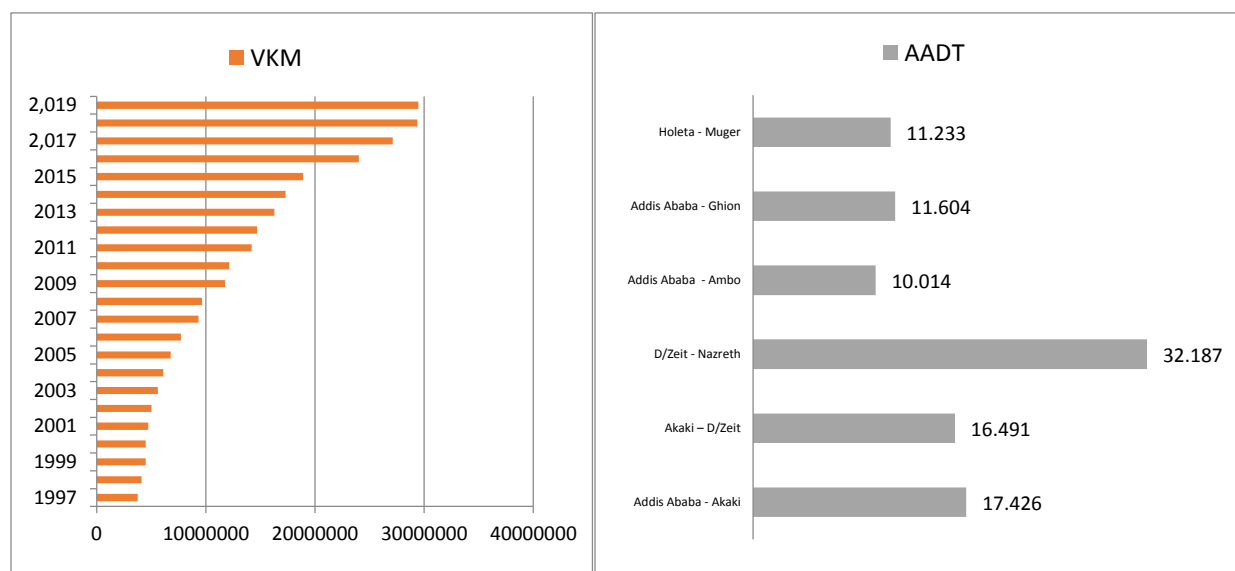


It's to be noted that Ethiopia only has about 13 percent of paved road network; out of which 87 percent are federal roads and the remaining 13 percent under municipalities; which is largely in Addis Ababa. It's below the sub-Saharan Africa level average of 21 percent.

3.9 Vehicle fleet and Traffic count

Ethiopian road traffic level by far is at its minimal level. As such, Ethiopian roads do not have high level of traffic volume to exhaustively make maximum use of the physical capacity of roads, nor hardly reach to the level of designed level of traffic volume. This is typical of federal roads, and more so especially on gravel roads. This is compared to road traffic volume level of other countries, by physical capacity to and design standard. Moreover, too low volume traffic, in terms of traffic use distribution, there is uneven distribution level as more than 80% of vehicles moved only on less than 10% of the total network. These paved roads concentrated mainly central part of the country radiating from Addis Ababa. Below Graph shows trend of vehicle km growth for road routes with AADT greater than 10,000 vehicles per day (vpd), and selected main traffic route roads radiating from Addis Ababa.

Figure 3.9: Traffic trend from 1997 to 2019



Source: Ethiopian Roads Authority Traffic Count, 2019. Figure. : Federal Roads with higher traffic 10,000 vpd

3.10 Vehicle Axle Load

Currently, there are about ten stationary weighbridges administered by the Ethiopian Roads Authority (ERA) located at strategic positions, and important sites throughout the country. The weighbridges operate full time, 24 hours a day and 7 days a weekend, and they are located in major arterial routes and high traffic import export corridors linking the country to the coast and other main corridors. Axle load law enforcement is further complimented by use of mobile weighbridges, mostly used for purposes of design studies and random axle load control. With the exception of 2007 and 2016, the number of checked front and rear axles had increased from year to year. The number of illegal axles has decreased from 38% (in 2003/04) to 6% (in 2015/16). Extent of illegally overloaded trucks Axle Load data from the 2002/03 to 2019/2020 is shown in Figure 3.10 below.

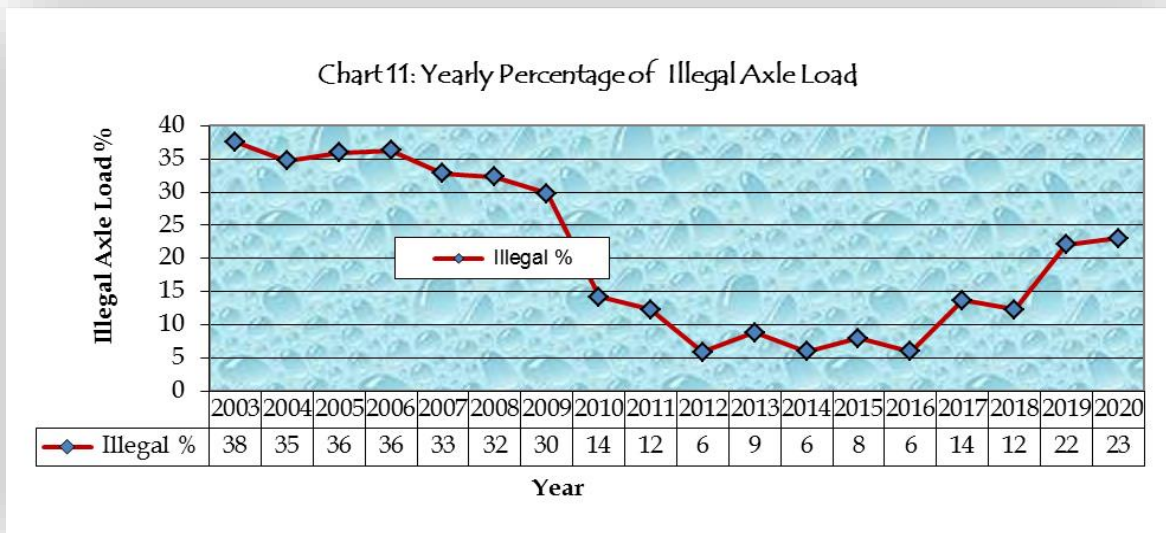


Figure 3.10 : Percentage of Overloading Source: Ethiopian Roads Authority

Axle overloading is a common prevalence and source of problem causing fast deterioration and damage of roads in Ethiopia. Overloaded vehicles were supposed to offload excess cargo, and the operators to be penalized at the nearby

courts. This could have brought improvement in the enforcement process and protecting the roads from further axle overload caused damage. However, there is no strict enforcement, and the penalty level is so small that it does not have deterring effect, neither discourage persistent offenders. Overloading has been increasing recently while at the same time ERA is claiming that it has strengthened its monitoring system both by increasing number of staff and automation at the stationary weighbridges.

3.11 Summary and Conclusion

Analysis of road network data, from International Road Federation (IRF), reveals that the low percentage of road networks in low-income countries and underdeveloped regions of the world. These results link poor quality roads, and lack of road infrastructure, to constrained economic development and growth. A reliable road network is important for low-income countries as strong road network can lead to massive economic development benefits. Analysis of the road network data reveals that Sub-Saharan Africa countries, to which Ethiopia belongs, account for just 6% of global road networks. With such small percentage of road networks, low-income countries have limited economic growth potential. Roads help economies to grow by linking markets and allowing the flow of goods, people, and services.

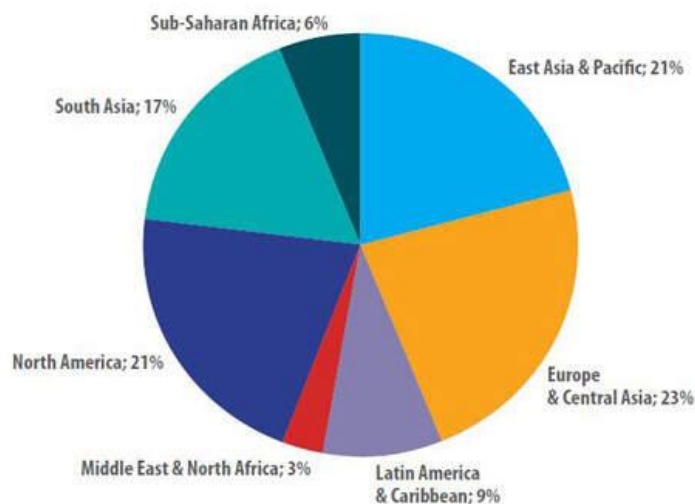
Because of the vastly different population densities, road networks per capita are much less disparate than those per square kilometer. Sub-Saharan Africa has a total road network of 3.6 kilometers per thousand persons, compared with a world average of 7.07 kilometers. In 2020, road network crude density measures in Ethiopia are about 1.4 km of roads per 1,000 population and 126 km per 1000 square km. By any standard, the levels are one of the lowest in the world, and by far below African average standards. For instance, accessibility index of richer countries is at about 94 percent, while it is 40 percent for poorer countries; and

around 60 percent for Ethiopia. Meeting a 100% rural accessibility target would imply more than tripling its current classified road network.

Table 3.6: Road Network/Population and Area

World Regions	Road Network per capita	
	Km/1000 population	Km/1000 sq.km
World	7	980
SSA	3.9	200
South Asia	3.2	700
Middle East and North Africa	4.8	750
Latin America and Caribbean	7	980
East Asia and Pacific	5.2	1050
Europe and Central Asia	12	1500
North America	24.8	3250
Ethiopia	1.4	131

TOTAL ROAD NETWORK DISTRIBUTION BY REGIONS (%)



Source: *The Burden of Maintenance Roads in SSA*

Within a period of seven decades, the road sector is showing remarkable results in terms of road stock increase and road condition improvement. The stock of Ethiopian road network increased from 6,400 km in 1951; to 46,812 km in 2010; to 85,966 km in 2015; and approximately to about 147,942 km in 2022. Over the last three decades, the road network tripled, and the road infrastructure spending

takes significant share of the budget. In Ethiopia, roads investment share estimated to take about 3.12 per cent of the GDP, for the years between 2010 and 2019, and reaching to high level of about 6 per cent in the year 2016. This compares with below 2 per cent of GDP record for Sub-Saharan Africa countries, and one percent for industrialized countries. The 2–3 percent of GDP typically found in fast-growing and emerging economies, and these are countries with already well-developed infrastructure and GDP growth rates of 2-3 percent.

Practices from elsewhere on road expenditure, as a percentage of GDP, varies from less than 1 percent of GDP in South Africa to almost 4 percent in Malawi. To some extent, this may reflect the fact that low-income countries are still developing transport networks, whereas middle income countries have typically established their basic transport platform and can devote themselves predominantly to maintenance. These are countries with already well-developed infrastructure and GDP growth rates of 2-3 percent.

CHAPTER FOUR

4 ROAD ASSET MANAGEMENT AND CLASSIFICATION

4.1 Introduction

Following a comprehensively integrated approach in addressing the road management system to improve accessibility and poor condition of roads. Ethiopia is among the most successful countries in showing improvement to its road connectivity and access system, the Road sector undergone through radical reform process and the Government kept on investing in road works to meet the objective of improving accessibility and connectivity to transform the socio-spatial landscapes and economic development. However, prior to the millennium, lack of comprehensive approach to maintenance in Ethiopia led to huge backlog of road maintenance works. Later, Under the Road Maintenance Initiative (RMI) program, which introduced the Road Fund, the RMI concept framework applied on the road sector program four building blocks of management, ownership, financing and responsibility for sustainable management. This has culminated into the introduction of Road asset management and financing programs.

Road asset management system includes the main pavement structure, roadside furniture's and facilities, bridges and culverts, earthworks, drainage, safety barriers, lighting, signs, trees and vegetation. Road are high value asset of a country as public asset infrastructure capital, which requires regular monitoring and evaluation in order to value for money. Efficient road asset management is needed to ensure utilization and proper management. Analysis of asset information will help to compare quantitative data for acquisition of meaningful information derived from inventories, network data and detailed surveys. Good asset management system will help us make informed decision at all levels, and in particular to those who are working in the road management system. To that

effect, it's important to have MIS, supported by state-of-the-art GIS based Road Asset management to analyze asset value from data management system.

4.2 Road Asset Management Indicators

The construction and maintenance of roads remained one of the key investment areas for Ethiopian government. It's evident that this trend will continue over the coming years. The RSDP initiatives created an off-budget dedicated revenue source from fuel levies and duty; which added road sector financing for network improvement and improved condition of roads. However, over 23 years of the RSDP, the share of road expenditure at about 6% indicates low level of road maintenance allocation, which is grossly under-funded. In 2016, it was taking 6.06% expenditure share of roads against nominal GDP, and for the rest of years less in amount. The figures illustrating the condition of roads may require further assessment to ascertain the estimates under current situation. Table 4.1 below shows the aggregate share of maintenance expenditure for over ten years.

Table 4.1 : Spending in Road Works between 1997-2020

Total Spending	414.74 bn Birr
Spending in Maintenance	24.44 bn Birr
Percentage Maintenance	6%

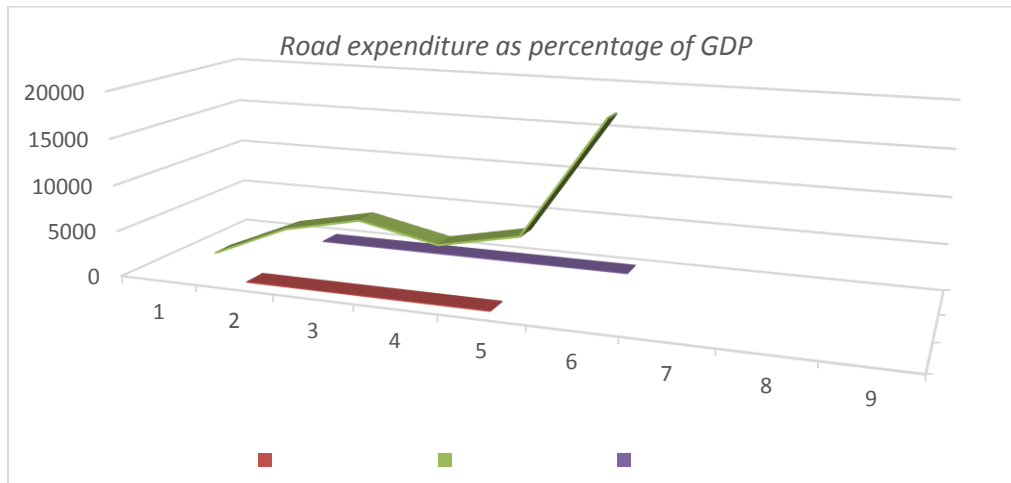
Source: ERA:-23 Years RSDP Assessment

Table 4.2: Road expenditure as percentage of GDP (In billion Birr)

Year	Nominal GDP	Expenditure on Roads	Percentage
2010	455.2	11.6	2.54
2011	515.1	14.6	2.83
2012	559.6	20.4	3.65
2013	618.8	21.8	3.53
2014	682.4	28.9	4.24
2015	753.2	37.2	4.94
2016	1,568.1	95.1	6.06

2017	1,717.1	34.0	1.98
2018	1,834.1	33.1	1.81
2019	1,987.2	37.3	1.88
Total	10690.8	334.0	3.12
<i>Source: National Bank of Ethiopia</i>			

Figure 4.1 : Road Expenditure as percentage of GDP



Source: National Bank of Ethiopia

4.2.1 Federal Roads

The Ethiopian Roads Authority (ERA) is responsible for managing the federal roads located throughout the country. According to the 23 Years RSDP Report, there are 28,699 km of roads under the federal government, out of which 15,886 km (55.4%) were asphalt roads and 12,813 km (44.6%) were gravel roads. It is estimated that 40% (6,355 km) of asphalt roads are Double Bituminous Surface Treatment (DBST) and the remaining 60% (9,531 km) of the roads are Asphalt/Cement Concrete (AC). Studies conducted by HITCON and DANA Consultants generally showed that the respective conditions of paved : unpaved road condition proportions 18%:13% for good, 37%:48% for fair, 27%:23% for poor and 18%:16% for very poor condition of roads. The combined conditions of good and fair roads, for paved and unpaved, having equal proportion of 51% to 61%, and paved roads generally having relatively better condition than unpaved roads with 13% good, 48% fair, 23% poor and 16% very poor.

Figure 4.2: Federal Road network by surface condition.

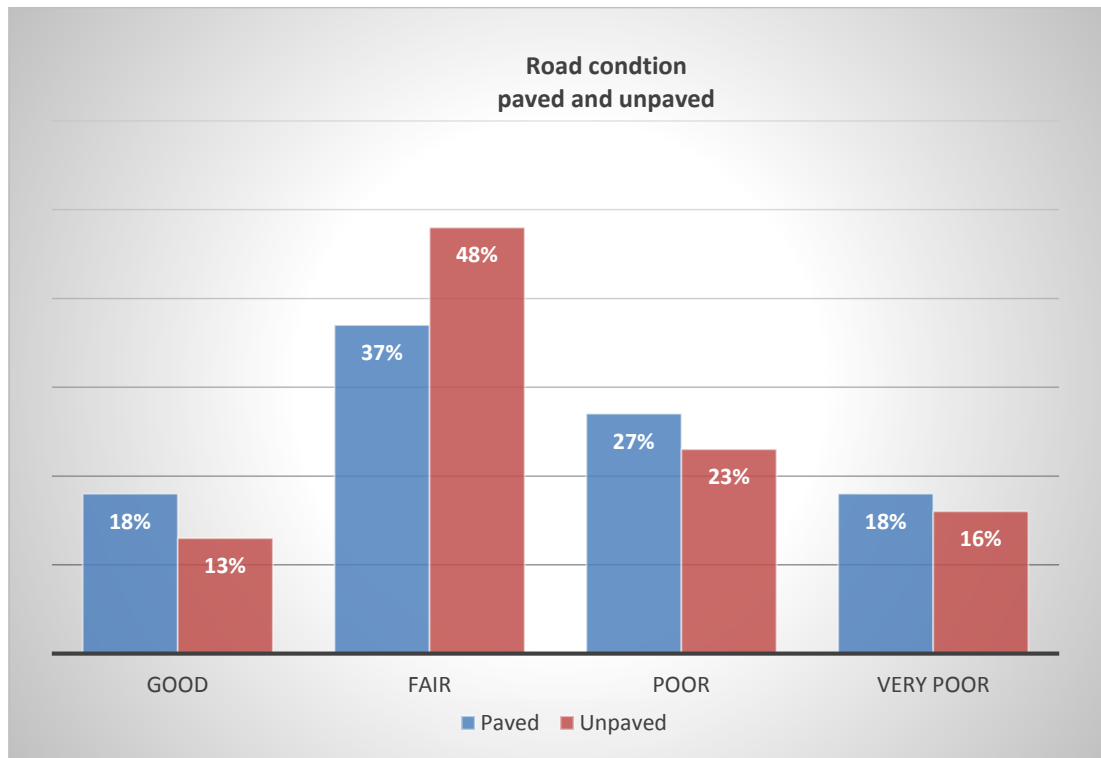
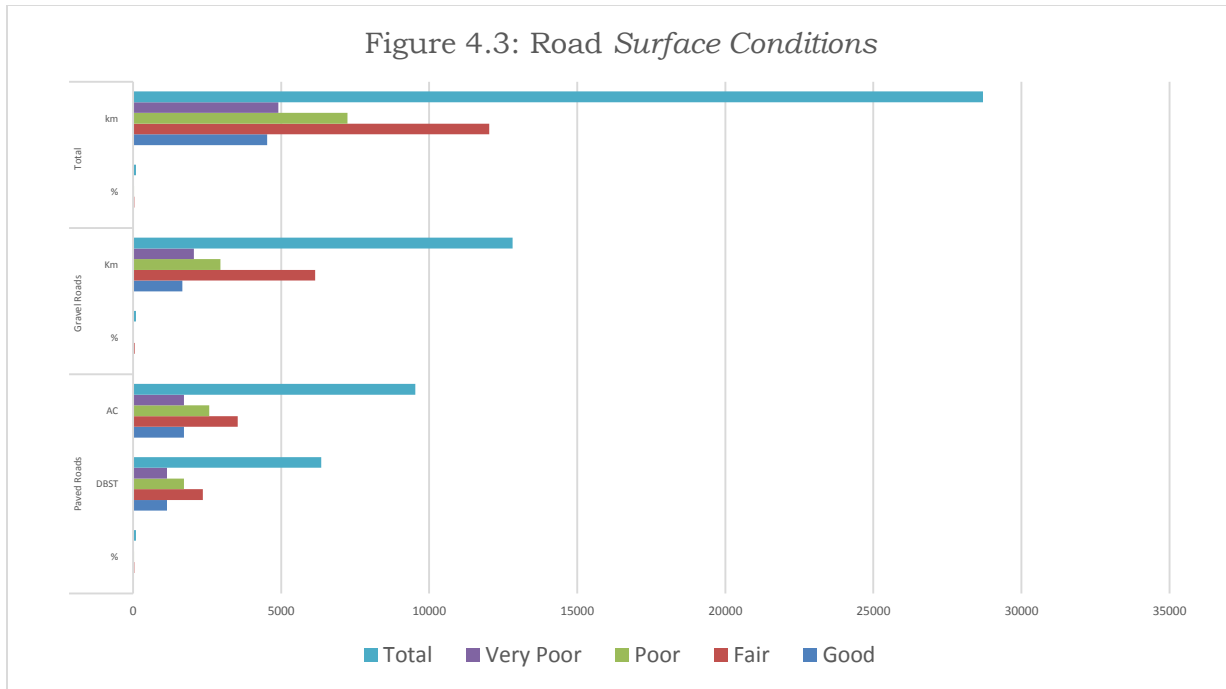


Table 4.3: Federal Road Network by Surface Conditions

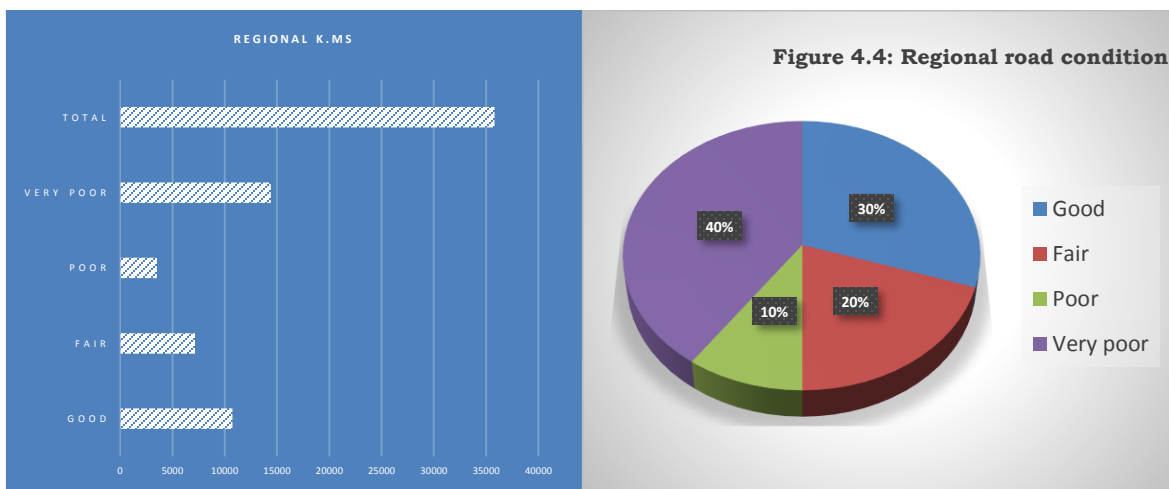
Road Condition	Paved Roads			Gravel Roads		Total	
	%	DBST	AC	%	Km	%	km
Good	18	1,144	1,716	13	1,666	16	4526
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Poor	27	1,716	2,573	23	2,947	25	7236
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Total	100	6,355	9,531	100	12,813	100	28699



Source: ERA and Consultants Estimate

4.2.2 Regional Roads

Out of the 35,806 km of regional roads, there are about 10,740 km (30%) in good condition, 7,160 km (20%) is in fair condition, 3,510 (10%) km in poor condition and the remaining 14,396 km (40%) are in very poor condition. It's assumed that roads under good condition will be routinely maintained, road under fair condition will be routinely maintained with re-graveling in every 5 years; roads under poor and very poor conditions are treated the same way but with higher per km cost.



Regarding cost allocation, the routine maintenance costs of regional roads are assumed to be half the costs of the Federal roads. This cost is taken as minimum and multiplied by 1.5 to adjust for adequate budget. The practice on costs allotted for routine maintenance on regional roads is performed with minimum allocative unit costs scenario to fill the budget gaps. Accordingly, minimum and adequate costs of re-gravelling calculated. Similarly, upgrading costs of regional roads are considered by taking half the cost of the Federal Roads. It is planned that an additional 2,000 km of new regional roads will be constructed between 2021 and 2030.

4.2.3 URRAP/Community Roads

It's estimated that there are about 55,808 km of roads under the URRAP classification of roads in the country. The carriageway width of these roads is 4.5 m. It has been assumed that the maintenance cost of URRAP roads to cost half the cost of maintenance for regional roads. It's equivalent to one-quarter of the Federal roads, which is Birr 183,724/km for minimum intervention and for adequacy of costs Birr 275,585/km. Accordingly, one quarter of the cost come to Birr 45,931/km in the case of minimum maintenance and Birr 68,896/km in the case of adequate maintenance.

It is assumed that three types of vehicles operate on URRAP roads, Four WD (40%); Small Bus (30%) and Small Truck (30%). Average annual daily traffic (AADT) record assumed to attract fifty vehicles per day. The AADT level of fifty is assumed considering the potential from agricultural activities of URRAP areas, and once roads maintained and opened for service. With potential of agricultural activities to generate significant traffic, after improvement of the roads in geometry and surface condition an annual traffic growth rate of 5% accounted. The costs entered onto the HDM-4 and the required results generated with the assumption that

50,000 km of URRAP roads will be constructed, in the coming ten years beginning 2021, and the assumed construction cost to be about Birr 1 million per km.

4.2.4 Urban / Municipal Roads

4.2.4.1 Addis Ababa Urban Roads

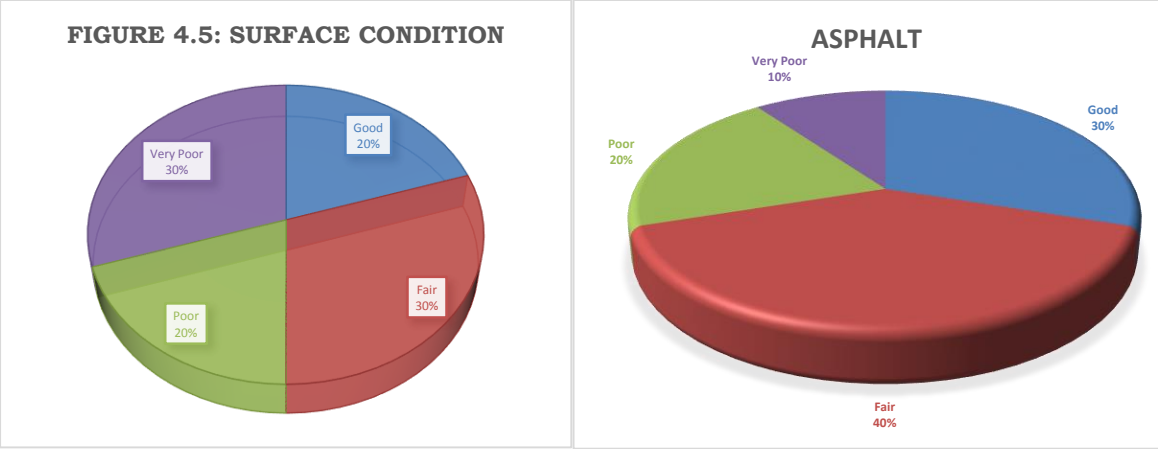
There are about 23,715 km of urban/municipal roads in the Country. The Addis Ababa City Roads Authority (AACRA) record showed that about 3,699 km of roads are found in the City; out of which 1,713 km are paved. The surface conditions of these roads are: 736 km (50%) good; 442 km (30%) fair; and 295 km (20%) poor and very poor, and same percentage values used for the analysis. Average annual daily traffic (AADT) on Addis Ababa asphalt roads is considered to range between 2,000 and 5,000 on gravel roads. For the Road Asset value analysis, about 100 km of gravel roads will be asphalted, and additional 315 km will be constructed to new asphalt roads standard.

The construction cost of new asphalt road is estimated to be Birr 25 million per km, and the unit cost factor escalates. Current maintenance costs of Addis Ababa roads have been considered the same as Federal roads that are Birr 132,827/km as minimum budget and Birr 199,241/km as adequate budget. Similarly, respective maintenance costs of gravel roads are Birr 183,723.54/km as minimum budget and Birr 275,585/km as adequate budget. ACCRA disclosed that 240 km of existing asphalt roads will be rehabilitated in the coming 5 years. In this study, rehabilitation costs accounted to cost Birr 20,000,00/km and yearly construction accomplishment scenarios are assumed at 10%, 20%, and 30%. Maintenance costs are taken as Birr 132,827/km in the case of minimum intervention and Birr 199,241/km in the case of adequate intervention. The Addis Ababa City Roads Authority (AACRA) planned about 30 km of expressway to be constructed. It was considered to be a 6-lane road, and the cost of construction assumed to be Birr

150 million per km. The maintenance cost of the expressway was considered to be Birr 453,934/km.

4.2.4.2 Other Urban Roads

The total length of urban roads in Ethiopia is 23,715 km. Out of this, 3,699 km is in Addis Ababa and the remaining 20,016 km are in urban areas outside of Addis Ababa. There are 1,500 km of asphalt roads and the remaining 18,516 km are: coble stone, gravel and service to traffic roads. These data aggregated as gravel roads and used as part of HDM 4 analysis. The 18,516 km roads were disaggregated under the surface conditions of: 3,703 km (20%) good; 5,555 km (30%) fair; 3,703 (20%) poor, and 5,555 km (30%) very poor. The asphalt surface of the 1,500 km asphalt roads were considered as: 450 km (30%) good; 600 km (40%) fair; 300 km (20%) poor; and 150 km (10%) very poor.



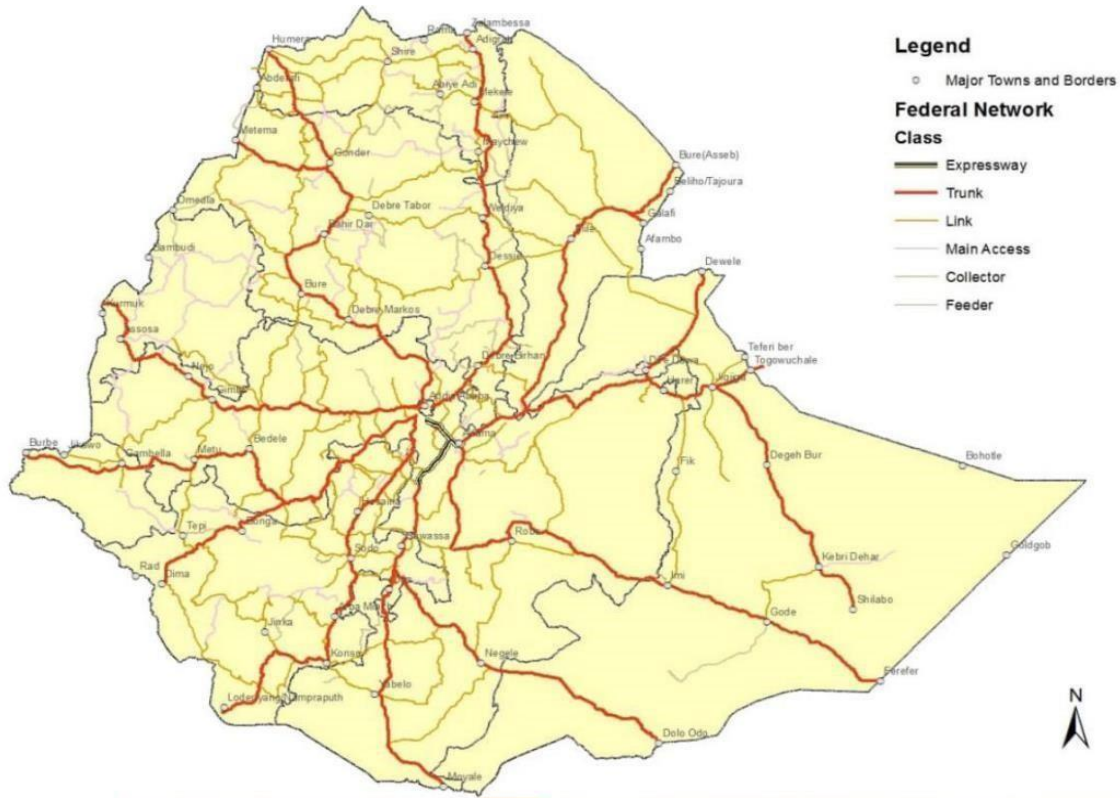
AADT for other urban asphalt roads was considered to be 3,000, and on gravel roads as 500. The maintenance costs of both asphalt and gravel roads in other municipal towns were considered half of the ERA maintenance costs i.e., Birr 66,414/km under minimum maintenance intervention and Birr 99,620/km under presumed adequate maintenance. In the case of gravel roads, the corresponding costs were considered as Birr 91,862/km in the case of minimum intervention and Birr 137,793/km in the case of presumed adequate intervention.

4.3 **Road Asset Management**

The Ethiopian Road Administration (ERA) is responsible for the management of road asset and setting standards for road network classification. Road Asset Systems Management Directorate (RASMD) is in charge of managing the system, gathering relevant information and data on road condition and traffic used for the analysis. The Directorate has a long-established road asset management application systems. Data and information are sourced from surveys, studies, documents gathered from stakeholders including actors working in road and bridge studies, design, construction, maintenance and inspection activities. Based on analytical results and findings, the recommended measures, and viable interventions, proposed for top management decision so as to ensure the upkeeping of the country roads and bridges.

According to Ethiopia's Federal Road and Bridge ANNUAL BOOK - 2021/2022, Road Asset System Management Directorate, ERA, currently have 5,636 bridges and 42,275 culverts registered under the Federal Road Network consisting of 28,716 km in total. The express way, which is about 300 km, has about 70 bridges administered by Toll Roads Enterprise. ERA is in charge of administering construction project for Express ways, as well. The Directorate provide technical advice to enable management to make informed decision in its working system, and the findings and analytical results used as bases for the development of nationwide road asset management strategy.

Map 4.1: ETHIOPIAN ROAD NETWORK LAYOUT MAP



ERA -Road Asset Systems Management Directorate - Annual Book of Road and Bridge data

4.4 Road Network Asset Valuation

The RNET model is a tool for assessing the performance of road maintenance and rehabilitation policies, as well as the importance given to the road sector in the national economy. It will help to provide concrete justification to stakeholders and to appreciate the need for and importance of continued support for road maintenance initiatives. The model is developed from the same principles underlying the accepted economic evaluation, engineering, and design model of Highway Development and Management Model (HDM-4). The model adopts the same road user costs relationships concept bases of the HDM-4 by applying simplified road deterioration equations derived from the outcomes of HDM-4 research. The analysis involves a series of analytical tools designed to evaluate the road network and road sector of a country.

RONET model is applied at a macro-level level by evaluating a series of representative road classes, which can be characterized by (i) functional classification, (ii) surface type, (iii) traffic level, (iv) road condition, (v) terrain, (vi) climate, and (vii) geographical region. The RONET analysis covered the entire road network system of the country, which are managed by ERA, RRAs, Municipalities and Woredas. The data inputs on Basic Configuration, Standard Configuration, Country Data, Road Network Length, and Historical Data, for the current condition assessment, inserted into the appropriate sheets of the RONET Model. Basic configuration provides information relating to the general administrative, road network classification, environmental, and geographical conditions and the traffic categorization reflecting situation of the country. RONET provided default values to reflect conditions in Africa, and inputs modified typically include Management type, Network type, Terrain type, Environmental types, Road condition class, Traffic Levels, and Traffic Categories.

Using the Road Network Evaluation Tools (RONET) model, it is possible to calculate the asset value of the existing classified road network in its current condition. It's expressed based on the assumption of percentage of the asset value of the same network had been found in entirely good condition. The Road asset value, as a percentage of potential maximum asset value, provides a more synthetic measure comparatively showing the status of existing road quality. This provides a systemic indicator of road network quality as the ratio is getting closer to 100 percent; i.e., the closer to 100% the network to have perfect quality. The value of this indicator is strongly influenced by the condition of the paved road network, as it has a much higher replacement cost per kilometer than the unpaved network.

4.5 Road Functional Classification

In Ethiopia, the main agencies responsible for the administration and management of roads are the Ethiopian Roads Authority (Federal), the Regional

Road Authorities (Regional), Wereda's (Local) and Municipality Road Authorities (Urban). These are respectively categorized under Federal, Regional, Local and Urban Road Authorities in RONET model. In the context of Ethiopia, as such there is no road categorized under private ownership. The country road network types classified as: Primary, Secondary, Tertiary, URRAP/Community and Urban.

According to ERA Pavement Design Manual, however, the functional classification system of the country's roads included: Expressway, Trunk Roads, Link Roads, Main Access Roads, Collector Roads, Feeder Roads, URRAP (Community) Roads and Urban Roads. Traffic categorization and Classes of ERA Pavement Design Manual are not compatible to RONET adopted values. Hence, the default values of RONET are reasonably maintained in place for traffic level and classes for Ethiopian condition. Table below shows coded relationship between Network type and management type of the Country's Road.

Table 4.4: Network Type, Terrain Type, Environment Type, and Management Type

Network Type	Terrain Type (1to 3)	Environmental type (1 to23)	Management Type
Primary	2	6	Federal
Secondary	2	6	Federal
Tertiary	2	6	Regional
URRAP	2	6	Local
Urban	2	6	Urban

4.6 **RONET Model Variable Inputs and assumptions**

Custom standard configuration relates to parameters for defining capital road works interventions to show the level of roughness and the time intervals for interventions. The roughness levels and the appropriate capital work interventions proposed in the default values for concrete/asphalt and surface-dressed roads are acceptable, and average roughness levels relating to periods of deferred

maintenance for gravel roads and earth roads are also considered reasonable. So, the default values related to roughness values, and required road work for classes of roads, are considered as acceptable for our condition as maintained. Custom standard configuration is set to reflect the desirable level of performance of the network. The various network types are therefore set to perform at specific levels to give an overall performance at the desirable level.

Table 4.5: Custom Standard Definition

<i>Code</i>	<i>Network Type</i>	<i>Selected Standard Name by Network type</i>	<i>Standard No:</i>
<i>R</i>	<i>Primary</i>	<i>High Standard</i>	<i>2</i>
<i>S</i>	<i>Secondary</i>	<i>Medium Standard</i>	<i>3</i>
<i>T</i>	<i>Tertiary</i>	<i>Medium Standard</i>	<i>3</i>
<i>U</i>	<i>URRAP</i>	<i>Low standard</i>	<i>4</i>
<i>V</i>	<i>Urban</i>	<i>High Standard</i>	<i>2</i>

From Table above we can see that, Primary and Urban Road Networks are categorized under High Standard Roads while Secondary and Tertiary Roads are categorized under Medium Standard Roads and Community Roads are categorized under low standard roads.

4.6.1 Country Data : Country-specific data obtained from the Ethiopian Statistical Agency (ESA), road agencies cost data, and traffic statistics. These country data are important to evaluate the road network based on different economical parameters.

Table 4.6 : Country’s Basic Data

<i>Basic characteristics</i>	<i>Units</i>	<i>Measure</i>
<i>Land Area</i>	<i>Sq. km</i>	<i>1,147,831</i>
<i>Total Population</i>	<i>Population million</i>	<i>104,300,000</i>
<i>Rural Population</i>	<i>Population million</i>	<i>79,800,500</i>
<i>GDP at current prices</i>	<i>\$ Billion</i>	<i>43,000</i>
<i>Total vehicle fleet</i>	<i>Vehicles</i>	<i>1,200,000</i>
<i>Discount rate</i>	<i>%</i>	<i>10%</i>

4.6.2 *Traffic Growth and Pavement Width : The following traffic growth factors are applied in the RONET computation.*

Table 4.7: Ethiopian Traffic Growth Rate and Average Pavement Width

Network	Annual Traffic Growth Rate (%/year)	Average Pavement Width (m)
Primary	9.8%	7.0
Secondary	7.5%	6.0
Tertiary	6.0%	6.0
URRAP	5.0%	5.0
Urban	10.0%	7.0

4.6.3 *Capital and Recurrent Road Work Unit Costs: The data for capital costs have been compiled from data provided by road agencies and Ethiopian Road Authority. A factor of 1.50 is applied on the current unit cost to account for inflation and the intensity of maintenance required but not applied on current values.*

4.6.4 *Road Network Length : The RONET Model classifies the road network distribution by network type, surface type, traffic category, and road condition category. Network lengths are converted into two-lane equivalent network length belonging to each road class, in kilometers. That means if there is a four-lane road, it is converted into the two-lane equivalent length, which is twice the length of the four-lane road.*

4.6.5 *Road Condition : There are five categories of road condition, but the Ethiopian road network is categorized only into three road conditions: good, fair and poor. However, the condition for cement concrete roads are currently categorized under very good and good since these roads are newly constructed roads.*

4.6.6 *Network length and utilization* : Length and Utilization output presents the total network length (km) and total network utilization (million vehicle-km) and the distribution by network type, surface type, surface class (paved or unpaved), road condition category, and traffic category. The country’s total road coverage data shows that about 13% is paved roads, and the remaining 87% is unpaved roads. However, the network utilization show that paved roads have high utilization rate of 89%, whereas the 87% of unpaved roads have only 11% utilization rate.

4.6.7 *Network Distribution Charts* This output presents network distribution charts of the network length, utilization, and maximum and current asset value by network type and surface type.

Figure 4.8: Network Length and Utilization

	Unpaved	Paved
Network Length (km)	128,710	19,232
Network Utilization Million Vehicle-km)	7,700	62,300

4.7 Road Network Asset Value

RONET output presents the total network maximum asset value and total network current asset value. It’s also providing asset value distribution by network type, road type, road condition category, and traffic category. The total maximum road network value of the country is estimated to have asset value of 16,570 million USD, against existing (current) network value of 13,538 million USD. Table 4.8 and Figure 4.10 show the network asset value by network type and surface type.

From total network value of the country, primary road has a maximum network value of 5,086 Million USD (31% of the total road network value), secondary road has a value of 3,210 million USD (19% of the total road network value), tertiary road has a network value of 3,208 million USD (19% of the total road network

value), community road has a network value of 1,611 million USD (10% of the total road network value) and urban road network has a value of 3,454 million USD (21% of the total road network value).

Figure 4.6: Proportion of Road Asset by Ownership

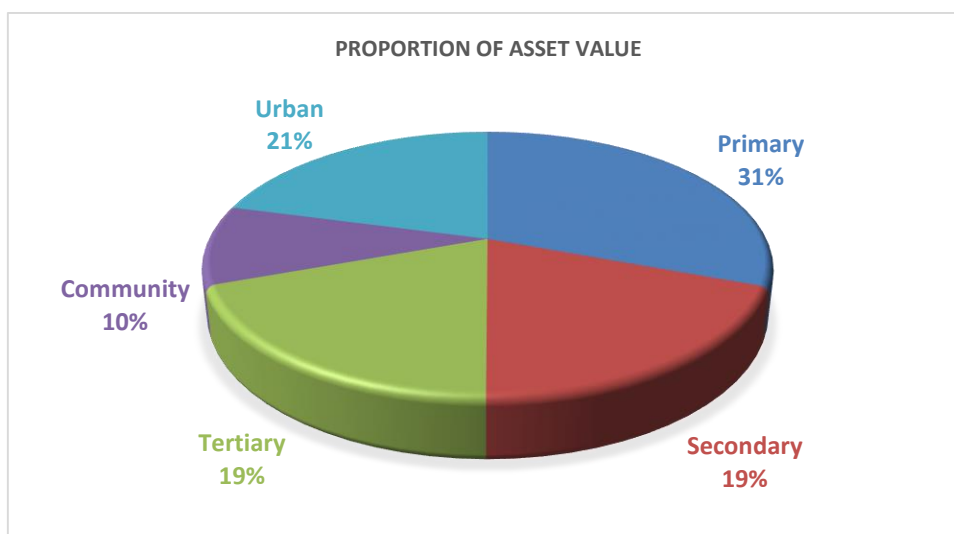
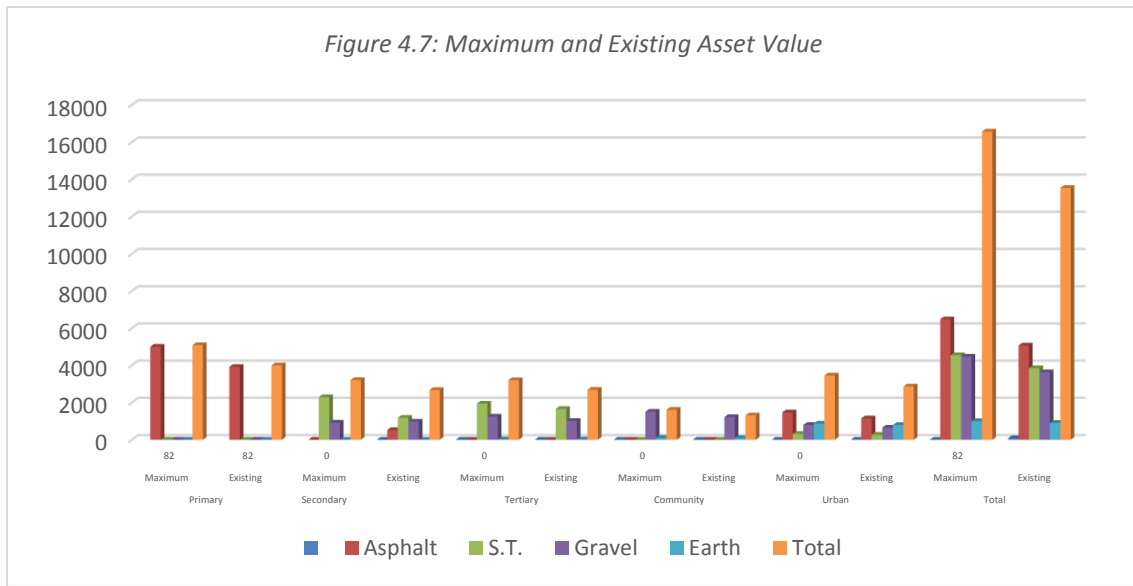


Table 4.9: Network Asset Value by Network Type and Surface Type
(Network Maximum and Existing Asset Value Million \$)

	Network Asset Value	Concrete	Asphalt	S.T.	Gravel	Earth	Total	Percent
Primary	Maximum	82	5004	0	0	0	5,086	31%
	Existing	82	3917	0	0	0	3,999	30%
Secondary	Maximum	0	0	2288	923	0	3210	19%
	Existing		523	1179	976	0	2677	20%
Tertiary	Maximum	0	0	1943	1244	22	3208	19%
	Existing		0	1658	1011	20	2689	20%
Community	Maximum	0	0	0	1507	105	1611	10%
	Existing		0	0	1218	94	1312	10%
Urban	Maximum	0	1470	315	797	872	3454	21%
	Existing		1151	265	650	795	2861	21%
Total	Maximum	82	6474	4546	4470	998	16570	100%
	Existing		5067	3849	3631	909	13538	100%
Percent	Maximum	0	39	27	27	6	100	
	Existing		37	28	27	7	100	



*Table 4.10: Network Maximum and Existing Asset Value
(by Network Type and Road Condition)*

	Network Asset Value	Very Good	Good	Fair	Poor	Very Poor	Total	Percent
Primary	Maximum	66	917	1851	2252	0	5086	31
	Existing	66	904	1613	1415	0	3999	30
Secondary	Maximum	0	532	1289	1389	0	3210	19
	Existing	0	523	1179	976	0	2677	20
Tertiary	Maximum	0	417	1540	1251	0	3208	19
	Existing	0	407	1401	881	0	2689	20
Community	Maximum	0	290	596	725	0	1611	10
	Existing	0	276	518	518	0	1312	10
Urban	Maximum	0	538	1462	1454	0	3454	21
	Existing	0	528	1325	1007	0	2861	21
Total	Maximum	66	2694	6739	7071	0	16750	100
	Existing	66	2639	6036	4797	0	13538	100
Percent	Maximum	0	16	41	43	0	100	
	Existing	0	19	45	35	0	100	

Figure 4.8: Asset Value by Network Type and Road Condition

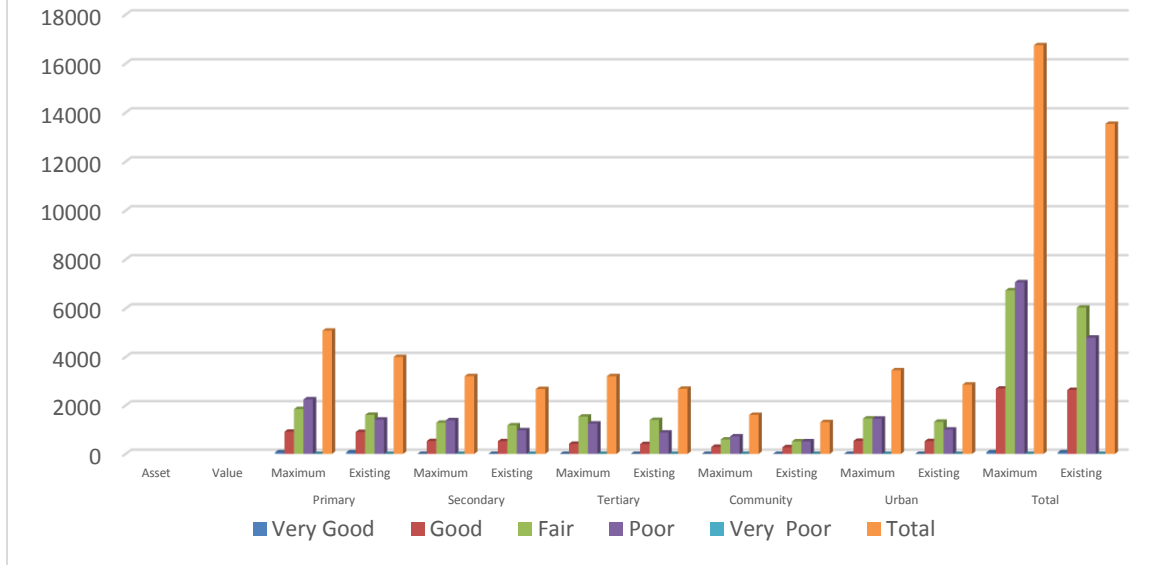


Table 4.11: Network Maximum and Existing Asset Value (Million \$)
(by Network Type and Traffic Level)

	Network Asset Value	Traffic I	Traffic II	Traffic III	Traffic IV	Traffic V	Total	Percent
Primary	Maximum	0	316	2268	1501	1001	5086	31
	Existing	0	262	1778	1175	783	3999	30
Secondary	Maximum	0	482	642	1766	321	3210	19
	Existing	0	402	535	1472	268	2677	20
Tertiary	Maximum	1410	963	642	194	0	3208	19
	Existing	1179	807	538	166	0	2689	20
Community	Maximum	840	687	85	0	0	1611	10
	Existing	688	557	67	0	0	1312	10
Urban	Maximum	284	552	590	876	1152	3454	21
	Existing	246	488	495	718	913	2861	21
Total	Maximum	2534	2999	4226	4337	2474	16570	100
	Existing	2113	2516	3414	3532	1964	13538	100
Percent	Maximum	15	18	26	26	15	100	
	Existing	16	19	25	26	15	100	

Figure 4.9: Network Asset Value by Network Type (Maximum)

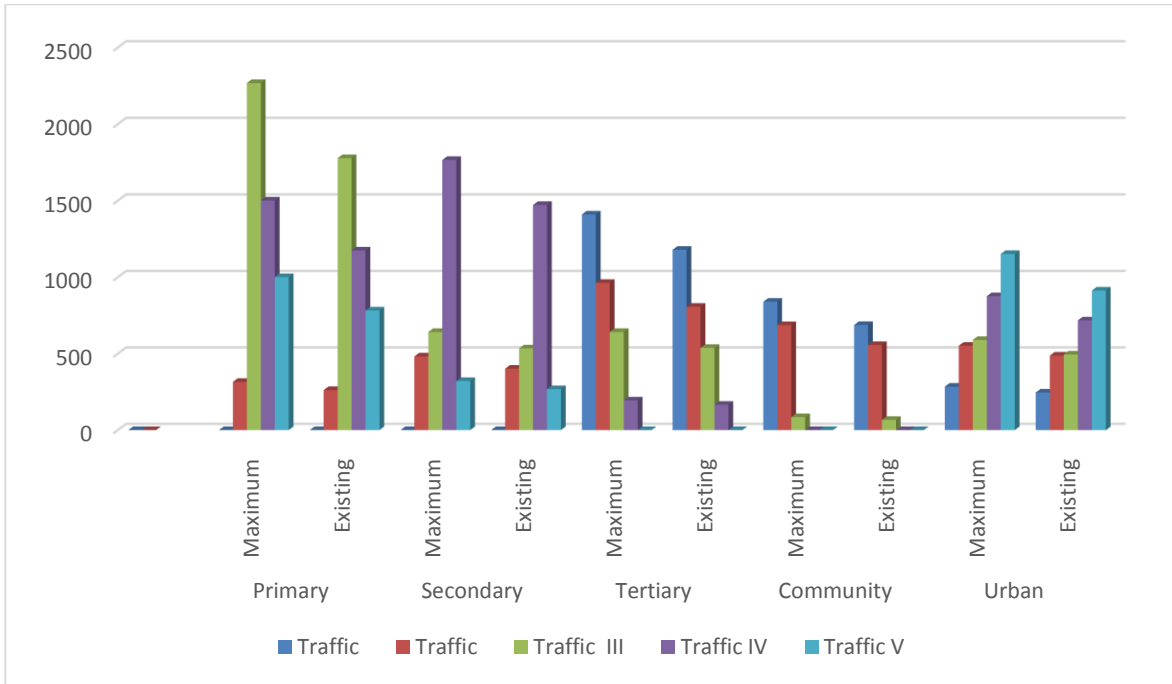


Figure 4.12: Road Asset Value by Network Type

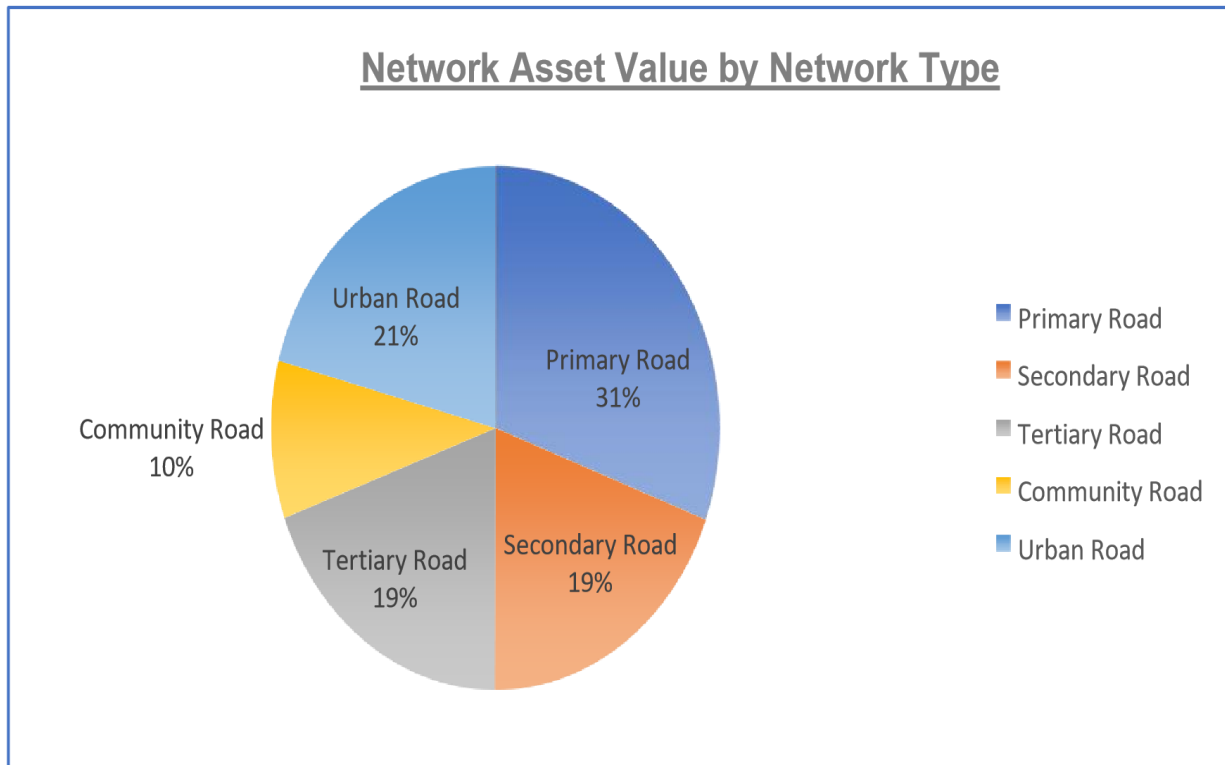
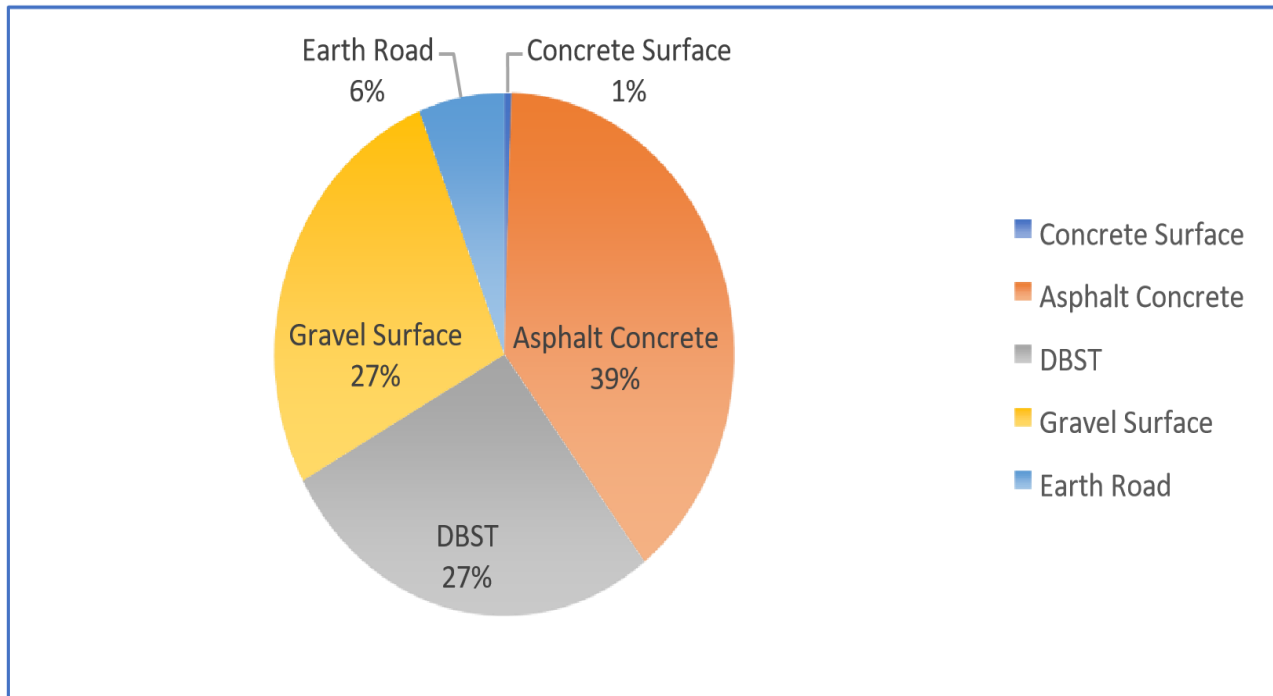


Figure 4.13: Network Asset Value by Surface Type (Maximum)



4.8 Road Asset Value

According to study sources from survey undertaken by RFO, Federal Road Network Master Plan, Strategic Plan of Ministry of Transport, data from Ministry of Urban Development and Construction, the roads in good condition are estimated at about 33,730 km (23%), fair condition 47,579 km (32%), and the remaining 66,633 km (45%) are in poor condition. The picture on road condition status is not that rosy and the disparity between them partly reflects poor planning, inadequate asset management, shortage of funding and partly inadequate capacity in different road administrations. In terms of having a common denominator, to serve as indicator on public asset value of roads, the road asset valuation method gives singular indication reflecting the significance and biggest share of fixed capital asset of a country. According to results of the RNET model, the total maximum road asset value of the road network is estimated to account Birr 664.0 billion (16.6 billion USD). The corresponding current road asset value

estimated to cost Birr 540 billion (13.5 billion USD) exhibiting the reduction of asset value by 18% due to inadequate maintenance.

Without detailed time-series data on road conditions, however, it is difficult to establish with precision what has been happening to the quality of the road networks in different parts of the country. The situation from another perspective of measuring road quality, as common indicator is the Global Competitiveness Index published annually by the World Economic Forum (WEF). The road quality assessment indicator is based on responses of rating on a scale of 1 (underdeveloped) to 7 (extensive and efficient by international standards). Aggregated responses produce a country average score. For 2019, the average score of 141 countries was 4.07 points; with Singapore scoring 6.5 points and the lowest scored by Chad: 1.9 points. The point for Ethiopia was 3.0 making Ethiopia 116th in terms of road quality from all the counties.

A common approach to determining the network-wide maintenance needs has been to compare the current condition of each road segment against the maintenance intervention criteria and treatments which have been based on technical and functional standards. The amount by which current needs exceed the planned expenditures defines the backlog of maintenance. To satisfy economic objectives, it is necessary to determine the costs against pavement maintenance standards that are economically optimal, as well as technically and functionally appropriate, in order to determine the level of expenditure that maximizes the net economic benefits.

4.9 Summary and conclusion

Based on variable inputs and indicators used for the RONET based model analysis, the following overall results are obtained from the analysis of the RONET model:

1. The total road network length of Ethiopia is 147,942 km. The classification of the road network based on network type and surface class is shown on Table 4.11 below.

Table 4.12: Length of the Road Network

Network type	Length (km)	Length (%)
Primary road	9,688	6%
Secondary road	19,011	13%
Tertiary road	35,806	24%
Community road	55,808	38%
Urban road	27,629	19%
Total	147,942	

2. The total maximum road asset value of the country's road network is estimated to have a value of Birr 664.0 billion (16.6 billion USD); whereas the corresponding current road asset value estimated at Birr 540 billion (13.5 billion USD) exhibiting the reduction of asset value by 18%. Tables 4.12 and Table 4.13 show the asset value per network type and surface class:

Table 4.13: Asset Value of the Road Network

Network type	Maximum Asset Value		Current Asset Value		Reduction in Asset Value	
	Million USD	(%)	Million USD	(%)	Million USD	(%)
Primary road	5,086	31%	3999	30	1087	36
Secondary road	3,210	19%	2677	20	533	18
Tertiary road	3,208	19%	2689	20	519	17
Community road	1,611	10%	1312	10	299	10
Urban road	3,454	21%	2861	21	593	20
Total	16,570		13538		3031	

3. With regard to the network asset value by Surface Type and Network Type, the findings of RONET analysis summary estimates by type of road as. Accordingly the share value of by road type is :-

- ⇒ Cement concrete road has an asset value of 82 million USD (0.5% of the total road asset value),
- ⇒ Asphalt Concrete has an asset value 6,474 million USD (39% of the total road asset value),
- ⇒ Double Surface treatment asset value of 4,546 million USD (27% of the total road asset value),
- ⇒ Gravel road has an asset value of 4,470 million USD (27% of the total road asset value) and
- ⇒ Earth road has a total asset value of 998 million USD (6% of the total road asset value).

4. The Table and the Figure show that paved road has a total asset value of 11,102 million USD (67% of the total asset value) while unpaved road has a total asset value 5,468 million USD (33% of the total asset value).

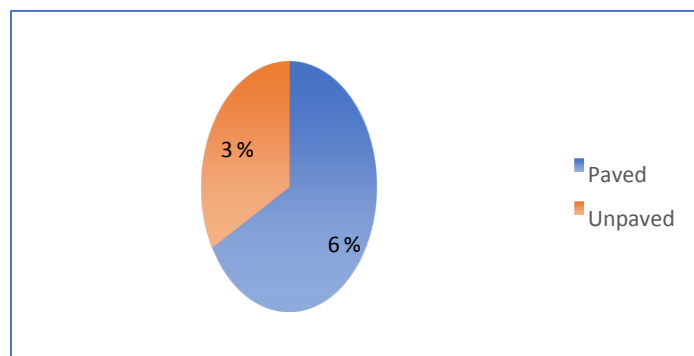
Table 4.14: Asset Value of the Road Network per Surface Class

Network type	Maximum Asset Value		Current Asset Value		Asset Reduction	
	Million USD	%	Million USD	%	Million USD	%
Cement Concrete	82	0	82	1	0	0
Asphalt Concrete	6,474	39	5067	37	1407	46
Surface Treatment	4,546	27	3849	28	697	23
Gravel Road	4,470	27	3631	27	839	28
Earth Road	998	6	909	7	89	3
Total	16,570		13538		3032	

Table 4.15: Asset Value of the Road Network based on surface type.

Network type	Length (km)	Asset Value (%)
Paved Road	19,099	67%
Unpaved Road	128,843	33%
Total	147,536	

Figure 4.14 Paved and unpaved Asset value proportion



CHAPTER FIVE

5 MANAGEMENT AND FINANCING OF ROADS

5.1 Introduction

In the early 1980's, and the 90's, a number of African countries in the road sector faced the build and collapse cyclic road maintenance problem to their Road sector. As a result, there was huge lose in their road sector investment, and transport cost increased unbearably affecting economic activities. To address the disinvestment faced in the road sector, transport planners and policymakers came up with strategic intervention of reforming the Road sector for the development of sustainable Road Management and Financing. The Road Maintenance Initiative (RMI), later called Road Management Initiative (RMI), came into play with appropriate road management and financing policy reform strategies. One of the key pillar areas of RMI focus on the creation of Road Funds (RFs) for adequate, sustainable and stable flow of funds for road maintenance.

The common practice established prior to the first-generation Road funds was the approach of earmarked budget allocation administered under the conventional national budget system. It was like earmarking of government revenue sources to partly dedicated to finance only road maintenance, to be administered following the traditional way under the ministry of Finance delivered by the concerned government departments. The approach failed to generate the required finance due to poor governance, poor collection and disbursement practices. Irregular and inadequate contribution to maintain the country's road network, calls for the establishment of an independent and autonomous Road Fund to be created on legal bases.

In response to the deteriorating condition of the road network, and the growing economic cost, stakeholder consultations were held to effect in promoting the Road Maintenance Initiative (RMI). The RMI enabled awareness, on the importance of

having a comprehensive approach to be followed for sustainable approach in road maintenance. Institutional autonomy for stable flow of funds, and having dependable source of maintenance financing, for Road sector is critical prerequisite for sustainability. The concept also introduced commercial management of roads, on a fee-for-service baseline principle, and ways for increasing resources bases of road maintenance, and having efficiency on resource allocation and utilization.

5.2 Road Maintenance Initiative (RMI) Framework

Maintenance intervention is made to prolong the life of the road in serviceable condition and the goal of road maintenance, is to ensure that roads remain serviceable for users throughout the design life. By reducing the rate of deterioration and protect the investments from further deterioration and building new road construction and rehabilitation; to lower the cost of operating vehicles on the road benefit from smooth running surface. It's to keep the road accessible for traffic and contributes to more reliable transport services to sustain social and economic benefits from improved accessibility. Overall, well-designed roads can last more than 20 years if adequate maintenance and proper interventions are done in good time on a regular basis.

The Road Fund concept framework is based on the principles that road users should pay the cost of provision for road use, and hence revenues generated from road users should conversely be used to cover road costs. This approach requires the creation of a road fund that generally becomes the main source of finance for road maintenance and other road expenditures. A key reason for setting up the road fund is that road maintenance should be given adequate attention, and budget allocation it deserves. Less attention and awareness on that road maintenance yields the highest economic return, and off-budget arrangement, which was controversially argued in managing it as independent system.

The principles of taxing road users asserts that charges should be economically efficient, equitable, and cost little to collect. In this regard, for instance vehicle fuel

levies are widely applied as they are relatively inexpensive to collect, easy to administer and reasonably equitable. In principle, they are also proportionate to road usage and following fee-for-service baseline principle. Main disadvantage is that they do not proportionately reflect the much higher damage caused to roads by heavy vehicles. Although trucks consume more fuel per kilometer than cars and would therefore pay more fuel taxes per kilometer traveled, this is not in proportion to their higher damaging effect to the roads. Therefore, fuel taxes need to be supplemented by additional fixed or variable charges on heavy vehicles; e.g. higher annual registration fees, axle based mileage toll payments, etc.

Tolls are used for specific roads, bridges and tunnels. Although they charge directly for the use of particular facilities and are therefore equitable, they are a relatively expensive means of raising revenue. Practically, from the start the Road Fund is not expected to start at a level to cover the full requirements of road maintenance in a meaningful way. From the start, however, the Ethiopian Road Fund fully covered the cost of routine maintenance activities and provided partial support to periodic maintenance works. It was not a position to support the maintenance of low volume/community roads. In view of the foregoing, a major increase in revenues to the Fund highly required, which also needs exploration of alternate charges.

5.3 Establishment of Ethiopian Road Fund

Lead by the RSDP Road sector reform program, and following the RMI concept framework, the Ethiopian RF created as a legal entity by the proclamation, issued on March 6, 1997, for the establishment of the Ethiopian Road Found. The establishment of Ethiopian Road Fund undergone through the steps of legal formation on its governance and Institutional formation. Prior to proceeding to actual operations of the Road Fund, in Ethiopia, there has been a number of preparatory measures taken in creating awareness. The process enabled to disseminate the subject matter of Road Fund, and hence the four-building blocks

of RMI. On the other hand, high level consultations gave the confidence to decision makers on the need for Road fund formation for sustainability. Done with the intention of promoting the four building blocks of the RMI conceptual framework, and following holistic approach, in applying the Road Financing and Management principles. Disseminating the knowledge bases undertaken to the road user groups, including the private sector, public agencies, users, community groups representing the various stakeholders.

The Ethiopian Road fund, established as a second-generation Road fund, has the objectives of financing road maintenance and road safety measures. The Road Fund Office opened in June 1998 and started operation, as secretariat office named as the “Road Fund Administration Office (RFAO)”. The Road Fund Office work with other Road and Transport agencies in charge of maintenance and keeping of highways, rural roads, urban roads and bridges safe. The Ethiopian Road Fund took advantage of unique commitment shown by the Government in dedicated the Fuel levy amount deposited to the specially maintained Road Fund account starting from September 1996. It was done with special directive of the Council of Ministers prior to its official formation. This clearly showed the commitment of the government towards establishing a strong Road Fund with firm startup foundation.

The introduction of road fund brought paradigm shift in terms of creating awareness on the impact of road maintenance and improved funding approach for road maintenance. However, the situation did not cover the true picture of the need, or the requirement from the Fund, as most of the main roads were under heavy rehabilitation/upgrading programs and the absorption capacity of road agencies was limited. This means that the Road Fund earnings have to increase by considering the growing requirements to maintain roads upgraded, rehabilitated and constructed under RSDP. As well, there was need to gradually increase maintenance funding for regional, municipal and URRAP road networks. It is important to see options to broaden the revenue base to ensure that the rates

should realistically reflect the true cost of road use payments, from users and other source.

5.4 Provisions of Road Fund revenue

One of the main factors in laying the ground for effectiveness of the Road Fund is the attention given to details on establishment of the office, legal base formation, and arrangement made in providing the autonomy. The proclamation, cited as the "Road Fund Establishment Proclamation No. 66/1997", has 18 sections with relevant articles addressing pertinent issues, which include title, definition, objectives, source & collection of funds, disbursement procedure, defined management board, powers and duties of the Road Fund office, auditing and relevant articles to meet the objective of Road Fund.

In regard to fund allocation and utilization, the regulation states that the Road fund monies shall be used for road maintenance, in particular initially to routine and periodic, and road safety measures. Hence the bulk of major maintenance fund for rehabilitation, and major periodic maintenance, to be sourced from Government budget allocation, and donor sources. As a result, the Government contribution made by dedicating the excise duty equivalent of fuel levies is taking major portion of the source of revenue for maintenance. As per articles stated on the establishment proclamation, the Office of the Road Fund has financing sources to come from:

- a) Budget allocated by the Government,
- b) Road Maintenance fuel levy,
- c) Annual vehicle license renewal fee based on axle load,
- d) Overloading fine, and
- e) Any other road tariff levied as may be necessary.

5.5 Fuel Levy and Consumption

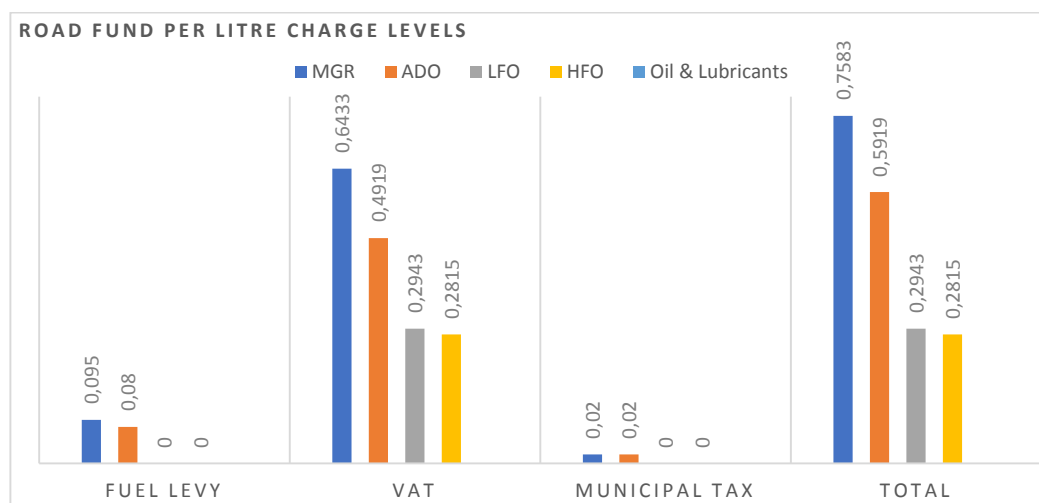
Fuel consumed is the main source of revenue for the road fund. Fuel consumption level used as bases for Ethiopian Petroleum corporation regular deposit made to

the Road Fund collected as channeled from Fuel companies. Fuel levy rates are component cost item built in the pump price of fuel. Prices are periodically revised by the Ministry of Trade & Industry (currently Ministry of Regional Integration and Trade).

Table 5.1 : Charges on Fuel Levy, VAT, etc. on Oil/Lubricants (ETB/liter)Product

Type of fuel	Fuel Levy	VAT/Excise	Municipal Tax	Total
MGR	0.0950	0.6433	0.0200	0.7583
ADO	0.0800	0.4919	0.0200	0.5919
LFO	--	0.2943	--	0.2943
HFO	--	0.2815	--	0.2815
Oil & Lubricants	--	--	--	0.1000 ²

Figure 5.1 : Road fund Fuel Levy Rates



Source:

Road Fund Administration Office

Accordingly, fuel consumption data, both in volume and value, obtained from Ethiopian Petroleum Enterprise. The growth rate in terms of volume / quantity is 6.9%, whereas it is 23% in monetary value terms. The variation noted, or

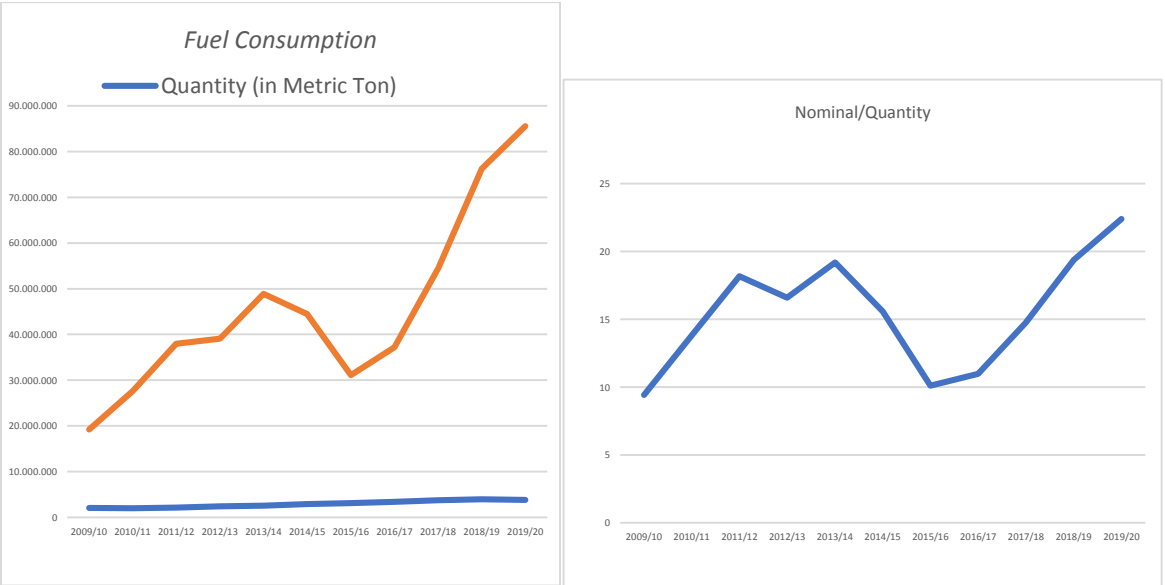
difference, comes from the change in price levels and the road fund levies do not show change accordingly except on excise tax component on percentile bases.

Table 5.2: Fuel Consumption levels

Year	Quantity (in Metric Ton)	Nominal Value (in '000 Birr)	Nominal/Quantity
2009/10	2,035,573	19,192,021	9.4283138
2010/11	1,996,811	27,575,653	13.8098463
2011/12	2,091,236	37,993,848	18.1681302
2012/13	2,357,338	39,094,030	16.5839731
2013/14	2,547,103	48,866,156	19.1849941
2014/15	2,855,277	44,470,349	15.5747933
2015/16	3,079,647	31,131,971	10.1089414
2016/17	3,391,363	37,226,166	10.9767565
2017/18	3,693,346	54,489,560	14.7534404
2018/19	3,936,625	76,282,811	19.3777185
2019/20	3,822,968	85,589,632	22.388268

Source: Ethiopian Petroleum Corporation

Figure 5.2: Fuel consumption in Quantity and Nominal Terms



5.6 Road Fund Allocation and Utilization

The objective of the road funds is to provide an adequate and stable source of finance. The revenues generally come from two main sources: (i) road user charges; and (ii) transfers from part of the government's general tax revenues; which is fuel VAT. The first source is relatively stable, while the second is highly unstable. During the early years while road revenues build up, road users will probably have to accept the long-term objective of full cost recovery for roads. This means eventually using the road fund to finance all routine and periodic maintenance, rehabilitation programs and all new investment. The order of strategy followed are :-

- routine maintenance should receive highest priority;
- specifying the core road network at every level that receive maintenance at times of imbalance and critical shortage of the Fund;
- the remainder of the network to receive minimal maintenance in the form of spot patching and emergency maintenance; and
- new roads should only be built when funds are available for maintenance.

The proportion of the budget allocation shares for Federal Roads, Regional Roads and selected Municipalities and urban areas are shown in Table 4.6 below. From total allocation, the RF modality earmarked a 2 percent road safety allocation for road safety.

Table 5.3: Budget Allocation Mechanism (%)

Road Agency	MAP based applied from the start of RF	Currently applied Percentage
Federal Roads (ERA)	70%	65.0
Regional Roads (RRAs)	20%	25.0
Selected Municipalities (MRAs)	5% (Addis Ababa)	10.0
	5% (All other towns)	
Total	100%	100.0

5.7 Lessons from Road Fund

In Ethiopia, the road fund, established as a legal entity, governed by specific legal provisions, which is managed by a board with its own staff. It is mandated to keep accounts and publish regular reports. The road funds are thus financing mechanisms, not executing agencies, channeling funds into bank accounts of designated beneficiaries. Planning and execution of road works is invariably carried out by respective road agencies. The legal basis of the road fund and board is generally secure. The Road Fund serves as financiers rather than providers of services, with the programming, tendering, evaluating, negotiating, awarding, supervising, and managing of contracts generally being the responsibilities of the road agencies to which funds are allocated.

One of the weakest areas of road funds relative to expectations is the lack of adequate monitoring and evaluation systems. Information on changes in the condition of the road network is sparse, and what is available is often unreliable. While monitoring and evaluation is a responsibility of the road agencies rather than of the road fund, establishment of a fund was expected to result in a better monitoring system. A fund was supposed to have the interest and leverage necessary to demand from the road agency the establishment of adequate monitoring. Overall, the fund lack basic indicators to judge the performance of the road agency they provide funds. Better monitoring should be a key area for improvement, and improved monitoring would also permit more frequent empirical assessment of the road funds.

5.8 Status of Road Maintenance Financing

Assessing the sufficiency of road funds in future years requires analysis of the historical costs associated with the provision of roads and the current condition of roads. The impetus behind examining current road system costs, as well as expenditures, is to provide historical comparisons between measures of

sufficiency, such as fund revenue comparison with maintenance costs. This allows future forecasts to be viewed through the lens of current conditions and future expected performances. In view of these, road fund revenue estimates are calculated, and are compared with maintenance cost estimates for 10 years (2021 - 2030).

The forgoing analysis and facts by themselves show that road funds are not a panacea to help solve the funding of road maintenance and good asset management. In all cases, however, it now appears that renewal of road fund usage commitment is essential to successfully fund road maintenance following modern asset management system and maintenance culture throughout the country. In order to have full cost recovery of the huge maintenance needs, there is need to increase in sources and amounts of revenues to the Fund. This includes the introduction of additional new sources of road use related payments and levies. In addition to conventional road user charges, private finance in future need to be mobilized for construction and maintenance of roads. It is likely to remain limited to the highest trafficked federal and urban roads around Addis Ababa, and even then it is to be expected that only partial funding solutions may work.

The Ethiopian Toll Roads Enterprise started its tasks with managing Addis-Adama Expressway and gradually increasing its coverage to Dire Dawa-Dewelle and Modjo-Hawassa toll roads. Regarding Expressway of road, ETRE itself may face a challenge in maintaining, or upkeeping to desirable standard, due to the potential of having inadequate funding and limited experience. This may call for merging the duties and responsibilities, and the scope of work of Ethiopian Road Fund Administration office with Ethiopian Toll Roads Enterprise so as to achieve the longer-term mission of financing road maintenance and road development under one umbrella and institutional setup.

Based on above shown cost estimates, the minimum and adequate budgets calculated using HDM 4 for the analysis period of ten (10) years. It is assumed that good roads will be sustained with adequate budget. Fair roads will be

periodically maintained every five years, in addition to annual routine maintenance. Poor and very poor roads are assumed to be rehabilitated. The results are presented in consecutive tables, and costs are just periodical and not discounted. Federal gravel roads have been assumed to be upgraded to asphalt standard gradually. According to the long-term plan, however, in the coming 10 years period, only 6,600 km of roads will be upgraded with the assumed rates of upgrading works. It is also assumed that 5,000 km of new asphalt Federal roads will be constructed between 2021 and 2030.

Improvement and maintenance costs of both paved and gravel roads were provided by the Ethiopian Roads Authority (ERA). These costs are taken as minimum costs required in preserving the road network. Currently, it's only 16% of the federal road network in good condition, which partly shows that the current maintenance intervention is far below the required standard. With this understanding, it is assumed that one and half (1.5) times of the current/ minimum maintenance costs provided by ERA seems reasonably adequate to undertake the required intervention to up-keep the network. Below table shows average minimum and adequate maintenance costs for different intervention by surface type.

Table 5.4: Minimum and Adequate Road Maintenance Improvement Costs

Road Types	Unit Costs (Birr/ km)	
	Minimum Budget	Assumed Adequate Budget
	Routine Maintenance	
Asphalt Concrete AC	151,311	226,967
Double Base surface Treatment DBST	132,827	199,241
Gravel (GN/GC)	183,724	275,586
Periodic Maintenance		
AC	1,596,097	2,394,146
DBST	1,574,639	2,361,959
Gravel (GN/GC)	749,987	1,124,981
Improvement		
Upgrading	15,000,000	
Reconstruction/ Rehabilitation	20,000,000	

Source: ERA and Consultants Estimate

5.9 Road Fund Financing and Maintenance Gap

Sufficiency of road funds for road maintenance requires analyzing of historical costs associated with the provision of roads and current condition for roads. The impetus behind examining current road financing costs, as well as expenditures, is to make comparisons between measures of sufficiency, to such as fund revenue with maintenance costs. This allows future forecasts to be viewed through the lens of current conditions and future performances. In view of these, road fund revenue estimates compared with maintenance costs as estimated for ten years (2021 - 2030). The historical average nominal annual growth rate of road fund revenue for 1997 to 2020, is about 15 percent. Assuming that this trend will continue, road fund revenue estimation for ten years is estimated to amount Birr 69.3 billion. Minimal and adequate maintenance requirement gap for 2021-2030 are shown on Table 5.5 -5.6, and Figures 5.3 to 5.6.

The maintenance cost estimates for federal, regional, URRAP, Addis Ababa and other urban roads are also calculated categorizing them into minimum and adequate expenditures. The minimum maintenance cost estimations show the minimum expenditure needed to sustain the usage of roads at minimum standard only through routine and periodic maintenance. Whereas adequate maintenance cost estimates are needed in up keeping and rehabilitating roads so as to preserve the road network in its originally constructed condition. In both minimum and adequate cases, cost estimation is expected to take wild swings at the beginning and ending years, as the current conditions of roads require major rehabilitation and periodic maintenance.

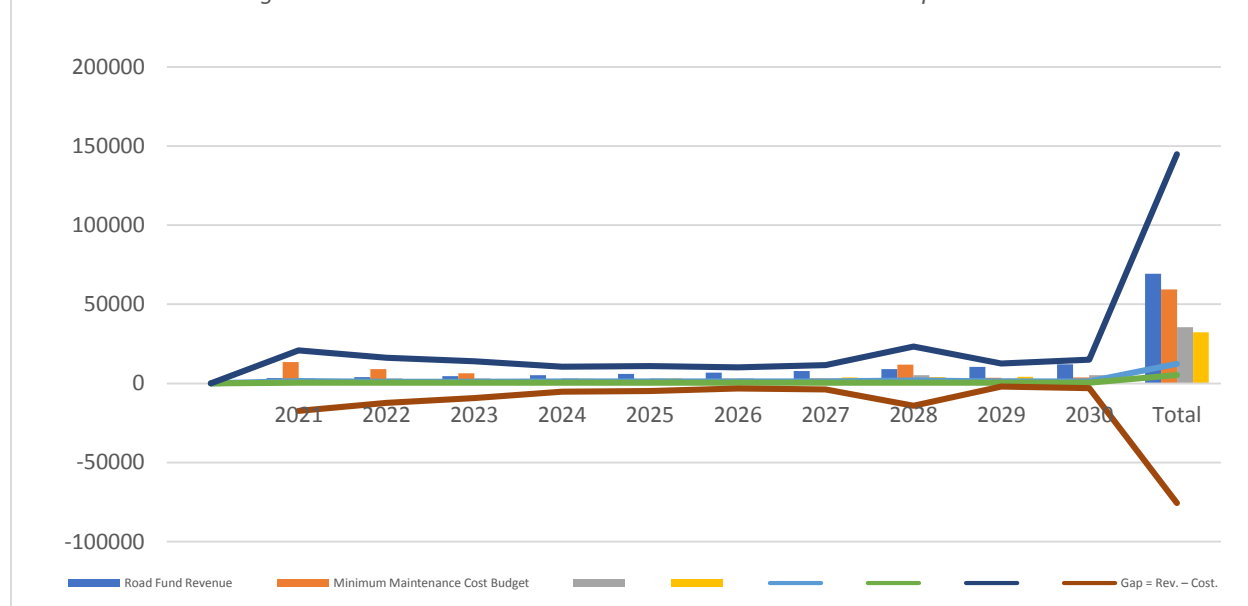
It is observed that federal roads, covering more than 50% of the total cost, acquire the largest proportion of maintenance cost. When the revenue estimate is compared with total maintenance cost estimate, for both minimum and adequate cases, which clearly witness the huge gap between them. This means if the revenue stream continues with the current trend, it will not be able to cover even the minimum maintenance needs. The persistent dominance of maintenance costs

over road fund revenue may imply that through time, fewer projects can be undertaken, and maintenance work comprised and deferred. This can create a situation where the condition of roads to deteriorate.

Table 5.5: Minimum Maintenance Requirement and Gap (In million Birr)

Year	Road Fund Revenue	Minimum Maintenance Cost Budget						Gap = Rev. - Cost.
		Federal	Regional	URRAP	Addis Ababa	Other Urban	Total	
2021	3411	13413	3,106	2,307	1,465	523	20814	-17403
2022	3923	8992	3,115	2,536	1,054	523	16220	-12297
2023	4511	6387	3,125	2,766	1,082	523	13883	-9372
2024	5188	2660	3,133	2,995	1,202	523	10514	-5326
2025	5966	2803	3,143	3,224	1,159	523	10852	-4886
2026	6861	2938	3,151	2,307	1,166	523	10085	-3224
2027	7890	3113	3,161	3,684	1,166	523	11648	-3758
2028	9074	11812	5,197	3,914	1,803	523	23250	-14176
2029	10435	3502	3,179	4,144	1,166	523	12515	-2080
2030	12000	3780	5,215	4,374	1,166	523	15058	-3058
Total	69259	59401	35,526	32,252	12,429	5,230	144838	-75579
Percentage	48	41	24	22	9	4	100	

Figure 5.3: Road Fund Revenue and Minimum Maintenance Requirement



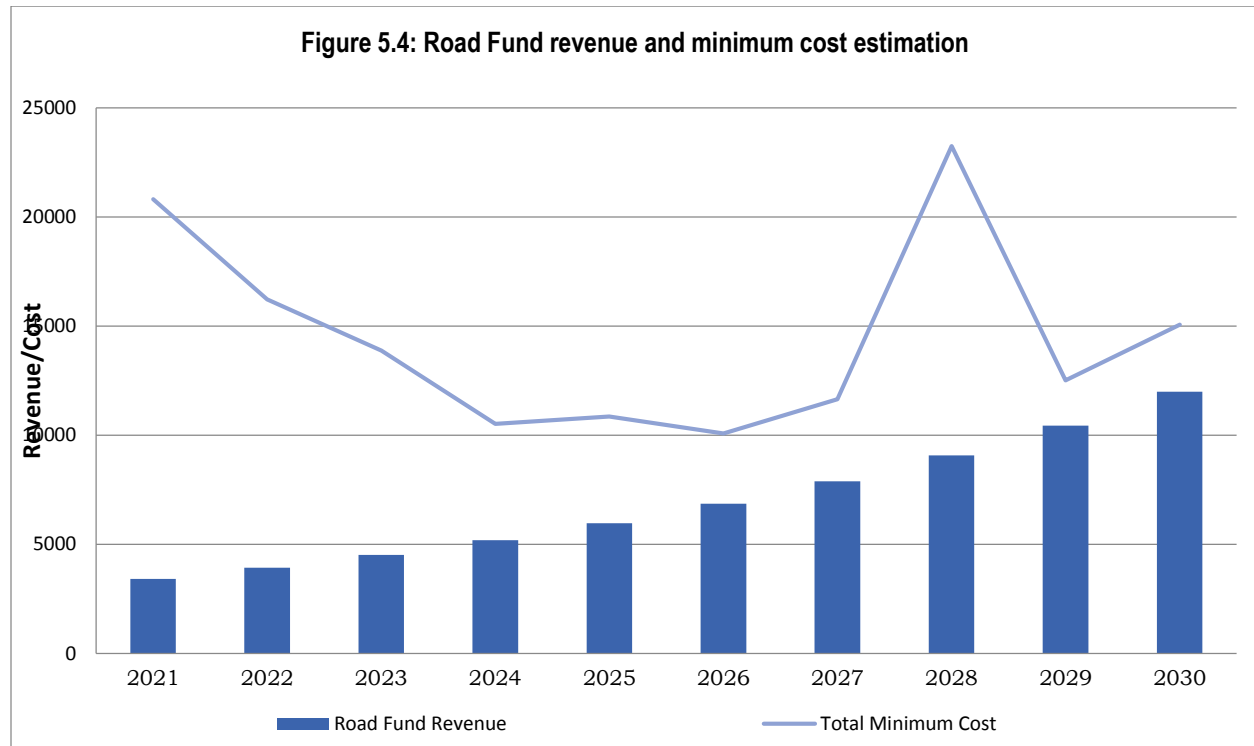


Table 5.6: Adequate Maintenance Requirement and Gap (In million Birr)

Year	Road Fund Revenue	Adequate Maintenance Cost						Gap = Rev. – Cost.
		Federal	Regional	URRAP	Addis Ababa	Other Urban	Total	
2021	3411	53419	11414	3,461	2,465	689	71448	-68037
2022	3923	56203	4673	3,805	1,494	788	66963	-63040
2023	4511	42880	4687	4,149	1,494	788	53998	-49487
2024	5188	3992	4700	4,493	1,695	788	15668	-10480
2025	5966	4205	4714	4,837	2,195	2,653	18604	-12638
2026	6861	4408	4727	3,461	1,749	788	15133	-8272
2027	7890	4671	4742	5,527	1,749	788	17477	-9587
2028	9074	18988	7795	5,872	2,793	788	36236	-27162
2029	10435	5256	4769	6,217	1,749	788	18779	-8344
2030	12000	5673	7823	6,561	1,749	788	22594	-10594
Total	69259	199695	60044	48,383	19,132	9,646	336900	-267641
Percentage	21	59	18	14	6	3	100	

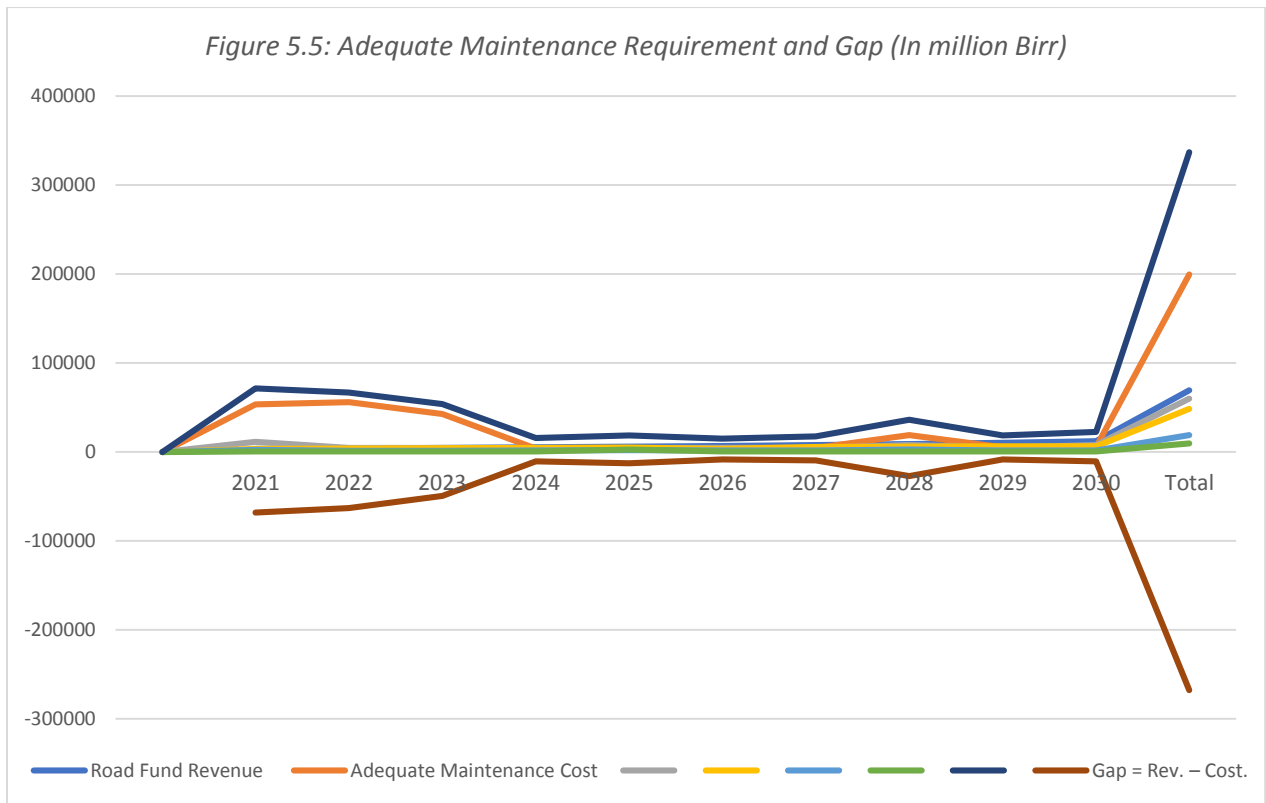
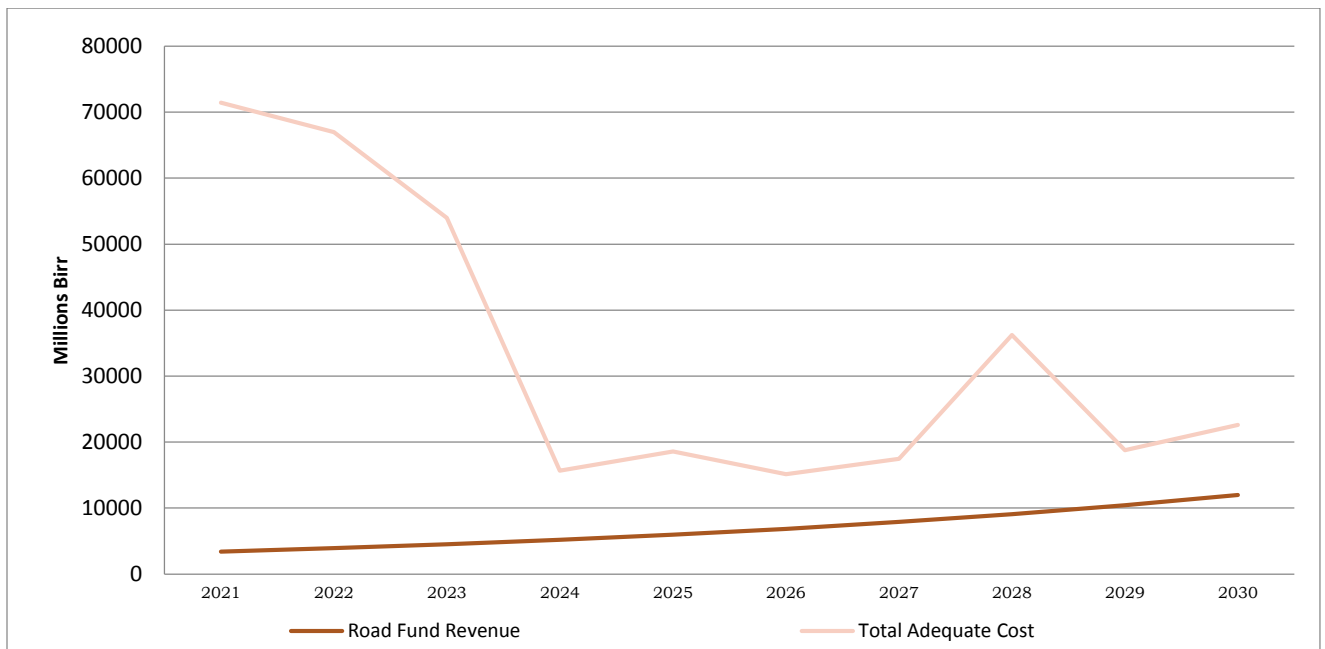


Figure 5.6: Adequate Maintenance Requirement and Gap



The total expected Road Fund revenue, with an annual increase of 15%, would amount to about 70.0 billion against the total requirement of Birr 145.0 billion. This is not worse as the maintenance requirement includes URRAP and all municipal roads which are not treated by the RFO at the moment. According to the data analysis, for instance for the year 2021, to undertake minimum maintenance all types of road network, there is a gap of Birr 17.4 billion. The required funding in undertaking routine and periodic maintenance is six-fold when compared to the amount compared with mobilized amount by the RFO for the year under consideration. The gap narrows to half of what is required when the 10 years (2021-2030) projection is considered.

Failure of government budgets, or the Road Fund, to provide adequate funding for road maintenance is one of the critical reasons why road infrastructure had deteriorated so much, and why the nation has been losing the value of its road assets at an alarming pace. The economic logic for effective preventative maintenance is undeniable. It can indeed be argued that the construction of roads, whilst consuming large amounts of money, is of limited importance if there is no effective maintenance. The conclusion is that system should incentivize maintenance over rehabilitation/reconstruction to reduce long-term deterioration and free up funds for building new roads.

In other words, the decision to let roads deteriorate over time is an act of disinvestment. Studies show that the yearly cost of maintaining a road is a small fraction of the investment cost, usually some 2-3% for a major paved road and 5-6% for an unpaved rural road. The analysis reveals that deferring road maintenance is self-defeating because it increases the operating costs of vehicles and because rehabilitating paved road is more than three times more expensive for the government than maintaining such roads on a regular basis.

5.10 **Summary and conclusion**

Road maintenance as such is not a heavy burden on the nation and economy if roads are maintained on time and adequately. The fact rather shows that too little spending on road maintenance is an even greater burden to the economy. Unless the nation has too many roads, or roads of the wrong type, proper road maintenance have an enormous overall saving to the nation. For instance, paved roads go through a cycle of accumulating roughness, despite routine and periodic maintenance, until they are restored to their original smoothness by rehabilitation. In other words, reactive efforts actions on (postponed maintenance and rehabilitation activities) seemingly dominate proactive actions (normal intervention).

The problem is, however, when proper and adequate asset management principle is applied. The current situation of Ethiopian road network requires a reasonable routine and periodic maintenance cost estimate plus major rehabilitation works to arrest the situation of roads found in poor and very poor condition to preserve the total road network in its originally constructed condition. In this case, the total required amount over the coming 10 years would therefore escalate to Birr 337.0 billion against what could be collected by RFO which is only Birr 69.3 billion; a five-fold shortfall or the collection is only about 20% of what is required.

Most of the time funding is directed to cover previously postponed, or clearing backlog of maintenance and rehabilitation activities, the capital available drained by focusing on building new roads which at later stage significantly depleted. When proactive efforts, meaning roads maintained timely, dominate reactive actions more resources for future maintenance are available. The number of deteriorated roads decline more rapidly, and more new roads are built. Older pavements deteriorate faster; which means it is more expensive to repair old and deteriorated roads.

In Ethiopia, maintenance expenditures have been so low that a substantial percentage of the initial capital investment in roads has been and continues to be eroded. This is a huge cost to society as it bears important opportunity costs. Instead, the money eroded could have been used for alternative investment opportunities. If proper maintenance were followed the extra amount (the difference between minimum requirement for maintenance and cost to be incurred to clear the backlog) could be used to construct about 10,000 km of new asphalt roads or about 40,000 km of new rural roads.

In the context of rural/community roads, it is often the case that a lack of maintenance not only increases VOC but will often prescribe the use of more expensive types or modes of transport. This may take place in the form of having to use 4x4 vehicles instead of standard 2-wheel drives. In extreme cases, when vehicular passage is no longer possible, the transport may have to revert to animal or human powered means of transport.

CHAPTER SIX

6 ROAD TRANSPORT SERVICES

6.1 Introduction

The development of efficient and effective road transportation system is a critical element for sustainability of social services and economic development. Cognizant of the fact that the Road Transport plays critical role, the sector deserves to have an in-depth analysis to look into its strengths, weaknesses, opportunities and challenges. Accordingly, the qualitative analysis is done with the intention of portraying the diagnostic of the road transport service sector. It is to be noted that the Ethiopian Road Transport service sector is tied up with multi-faceted problems, deficiencies and challenges. For instance, the sector is known to have supply side shortcomings and capacity limitation to effectively respond to need, with the required efficiency, and meeting the level of service on demand. Quantitative aspects analyzed in trying to show trends of development seen in the dynamics of its evolution, potentials for development, and existing modal spilt capacity assessment in response to the growing demand.

Road Transport diagnostics assessment will throw light in giving base information for decision making on the transport, trade and logistics operations of the country. Inadequacies, problems and challenges of the sector will thus be discussed to show the inherent features of noted inefficiencies and deficiencies. Giving due attention to the nature of problems, issues and challenges will lay firm foundation for regulatory bodies, and enforcement functions, so as to seek pragmatic solutions. From among others, the main problem area of the transport sector include the high cost of transport, poor accessibility, unmet suppressed demand, weak provision for infrastructure, high rate of traffic accidents, shortage of resources and inefficient transport management. In addition, lack of co-ordination, absence of clearly defined transport policy and weak enforcement capacity are typical source features of the sector. Due to resource and capacity limitation, however, there are too many problems and challenges faced by the sector which are

outweighing the number of solutions we can have in addressing the respective source problems.

Due to weak transport sector response to the socio-economic need of the country, there has been huge loss of the limited technical and financial resources of the country. Costs of inefficiency in transport operation are not merely contained in financial costs to the operator, but rather have direct and indirect social and economic impact to the economy. This is mainly reflected in terms of the cost of inefficient transport and logistic operation resulting from time loss, capital and externalities with adverse social effects. Ineffective and inefficient transport and logistics operation, less competitive operation and meeting the need are critical factors to assess for the development of dependable system. It will provide firm bases for policy decision makers, to make informed decision, as remedial measures for the number of problems, weaknesses and bottlenecks the sector currently faced. In addition, it is to show practical way for smooth and cost-effective transport services and logistics operation in the country.

To address the Road Transport services sector problems, it's important to follow a comprehensively integrated and coordinated approach. In this regard, one main consideration is diagnostics analysis on the pros and cons of the logistics and transport operation of the country. To this effect, having a comprehensive assessment on components of the Road transport services, and its logistics capacity, would give strong bases for having informed strategy development. The intervention costs with regard to Road Transport operation bring about outweighing benefits by all means in all sides. This is on the ground that there are a number of simple looking issues having ample room that call for immediate interventions. Hence, depending on how well we designed our actions, the interventions will bring about positive result.

6.2 Development of Road Transport Services

The introduction of modern land transportation is marked by the construction of the railway line between Djibouti and Ethiopia at the beginning of the nineteenth century.

Despite its long presence, the railway service share compared to inland transportation was not that significant, as railway modal share never surpassed the five percent mark in surface transport service provision. Air and rail transportation modes are taking limited share, and hence the road transport remain to play dominant role. Covering more than ninety percent of motorized freight and passengers' transportation, the road transport in Ethiopia not only play dominant role, but also play crucially detrimental role to the economy. This is expected to continue for the foreseeable future by taking significant share of the modal choice.

There is growing pressure generated from meeting the suppressed transport demand, and in responding to fast-growing population, and urbanization. For years, there has been a continuously growing unmet demand seeking for the development of adequate transport services and infrastructure development. Historical trends of development, as recorded on evolution of Ethiopian transport, show that there is responsiveness gap in meeting the steadily growing demand in line to the socio-economic need of the country. Interventions reflect the socio-political driven interest of the respective nations in power, and policies of the prevailing working system of the respective regime. It is to be noted, however, that use of non-motorized means such as walking, head loading and pack animal in Ethiopia also have important role to play, especially in rural parts of the country. For remote parts of the country, pack animal, head loading and walking are predominantly used as the only means to satisfy the mobility need of the rural community.

6.3 Milestones of Transition and Regulatory Framework

The recent reform established that the Ministry of Transport and Logistics (MOTL) to have the vested power to be in charge of the responsibility for policy and regulatory functions on air, road, rail, logistics and maritime transportation. In regard to road transport, the MOTL recently took over the vested powers of the former Transport and Communications (MOTAC), and the Federal Transport Authority. As a result, the new Ministry will be in

charge of duties and responsibilities focusing on regulatory functions on passenger and freight transportation, aspects of transport operation, setting standards for licensing, and enforcement of rules and regulations.

Operational functions of the transport sector are the responsibility of the regional bureaus. They have dual accountability in answering to the respective higher body in the region, and the Ministry with respect to policy and regulatory functions. At Federal level, the functions and responsibilities laid onto the respective accountable institutions as defined by articles of the respective proclamations establishing the regional and federal bodies. The sector needs strategic logistic system, in connecting the coast to the hinterland, to dependably position itself to back the socio-economic need of the country. Since Eritrean independence, in 1992, the Ministry is in charge of developing appropriate corridor-based transport and logistics system to enable connectivity of the country to the coast.

6.3.1 Legal Framework

In laying the foundation for modern road transport system, in regard to road transport regulation, Proclamation 16/1942 gave the first known legal bases for the development of institutionalized sector management. The next one, after nearly two decades, was the proclamation establishing the road transport administration which was enacted in 1967. It was a major milestone in forming bases for centralized command system known for being backed up by a strong institutionalization in the history of Ethiopian road transport system. The period recorded the creation of public sector led centralized system which opened lieu way for dominance of publicly managed Road transport operational system. Relative to the past, arguably, there has been radical change in shape and operating condition during the central command system of the operation in meeting the regime's political interest.

It was a major milestone period of transformation from privately owned, operating on a free market led system, to public sector controlled centralized system. During this period, private sector owners and operators forced to operate only under centrally commanded

operation, or as associates under the nationalized enterprises. The system lay the foundation for the creation of multitude of passenger and freight transport owners associations and private commercial operators. Under this regime “Dreg Regime”, all commercial transport operators were forced to come together, and organized under zones of influence, as members of passenger and freight transport associations. They are called the ‘Ketenas’ and take charge of the full responsibility of the transport operation and dispatch control. The ketenas were controlled by the then Ethiopian Freight Transport Corporation (EFTC), for freight transport coordination, and Public Transport Corporation (PTC) for passenger transportation.

6.3.2 Framework of operational control

In regard to the operational control, the proclamation 107/ 1976 enabled the government system to nationalize the private National Transport Companies and formed the National Road Transport Corporation (NATRACOR). The proclamation, which established the National Road Transport Corporation (NATRACOR), with vested power to have operational control, later split the corporation into EPTC and EFTC. The two corporations empowered to manage the nationalized trucks, trucks on its own account and trucks registered with private ownership as associates, or independents. They have full operational dispatch control power on privately owned trucks. As a result, commercial operators forced to come under one umbrella and controlled public command system of the road transport industry.

The corporation organized commercial trucks into five dry cargo zones (ketenas), and one for liquid cargo, having operational zonal influence area. Private commercial trucks are only allowed to operate as associate members in the respective Ketena system by paying five percent service commission. There are also public passenger vehicles operated by the Public Transport Corporation(PTC). Operational modality applied for passenger vehicles follow same procedure as EFTC. The PTC organized passenger transport association by the creation of groupings of long-distance, medium range and short distance operators on distance-based route allocation.

6.3.3 Towards centralized operation

As a result of a centralized command system of the transport operation, the role of the private owner was limited to operating and maintaining the truck, or buses. The central command system deprived private operators' access freedom to their operational choice. It goes against market-oriented competitiveness practices or private interest for profit maximizing operation. During this period, the government exercise full operational control having power for tariff setting and dispatch control. By then, unlike other countries, the tariff rate was fixed by government for main and rural roads by the Road Transport Authority. In terms of dispatch operation, as cargo transport was solely monopolized by government operation, the route assignment done by the Ketenas. Private truck owners were not allowed, nor have access, to give dispatch on their own trucks. Dispatch order, which is assumed to be given on a rotation bases, in principle, was not handled in a fair and transparent way in the interest of private operator through the zonal divided ketene system.

During the Derg regime, the government further stretched its power towards operational control to facilitate a number of public mobilizations, campaigns and logistics support for war operation. Done with the intention of responding to a continuous war operation, recurrent drought and campaign operations. The system never hesitated in making use of its regulatory and licensing powers to fulfill its strategic interest of having full control on the road transport operation. It was a period that brought unprecedented change in terms of converting the private sector operation to come under a fully controlled command system for sake of centralized transport operation.

6.3.4 Commercialization and Deregulation

During the periods of the regime, private truck operators were discouraged from investing in the transport business. Entry procedures were also cumbersome for new entrants and not able to replace their old-aged trucks. Due to shortfall in meeting demand, however, the government purchased large number of high-capacity trucks to EFTC fleet. EFTC in 1992 was then having about 800 own trucks and managed close to 3800 private trucks

as part of affiliated associates. This enabled them to meet their need of mobilizing the transport sector capacity for the purpose of the various campaign operations. As a result of regime change that followed the process started to show paradigm shift by going towards a more liberalized system.

Later, in 1980's and early 90's, the role of government gradually shifting to policy and regulatory functions, the process of commercialization started creating conducive environment for the private sector. The creation of voluntary associations based on proclamation 14/1992, which was a result of the deregulation process, pave way for commercialization, and market liberalization for the transport industry. It was therefore necessary for the existing regime to design a way for sector recovery to overcome shortfall by giving incentive schemes to attract private investors. Private sector operators favorably accepted it and started to react positively following the provisions of deregulation. Accordingly, the trucking capacity and business started to revive as a result of the enactment of proclamation 14/1992 that deregulated the dry cargo transport.

The process of deregulation has brought up radical changes to the road transport operational system. It was dismantling the ketena system and limiting the role of government only to focus on policy making and regulatory functions. Inherited fleet of EFTC subdivided in to three dry cargo and one liquid cargo enterprises; namely Bekelcha, Shebele, Comet and Woyra. They start to operate under a market oriented competitive environment keeping private operators as their associates, which are managed under the parastatals. Gradually, the emergence of the three ex-EFTC dry cargo transport operators, and private enterprises opened a way for the application of full-fledged commercialization practices in the sector.

Deregulation created conducive policy environment allowing the private to freely participate in the transport sector. This has brought up positive results in terms of encouraging the private sector to enter and exit to the market. Especially, the abolishment of the ketena system created an enabling environment to private operates to choose for organizational rearrangement in their operation. This lets them organize themselves in

any preferred way of forming an association, share company, or to operate as independent operator. In addition, they are free to operate in any part of the country, and freedom to negotiate the transport tariff rates for their service. They operate on market-based competitive market condition and directly start to deal with the cargo owner. During this time, as a result of deregulation, and commercialization, encouraging results were marked in the history of Ethiopian road transport sector.

6.3.5 Regionalization and Liberalization

Devolving power to the regions, from operational functions of the former Road Transport Authority, further enhanced the decentralization process of operational decisions to go into the hands of regional transport bureaus. In effect, strengthening of the decentralization process of the reform program very well devolved to a more regionalized transport service. In addition, the market force of liberalization process enabled to have a more decentralized operation, which was followed by augmentation of the regionalization process to regulatory functions. Later, the creation of voluntary associations based on proclamation 14/1992, which was a result of the deregulation process, pave way towards more commercialization, and market liberalization of the transport operation for the sector.

As a matter of operational preference in the market, operators with long haul trucks concentrate on port corridor while short haul operators operate on shorter distances to the hinterland areas. As a result, the long-haul operation turn to be more attractive and high-capacity trucks concentrate on long distance operation than the short haul. The effect on market balance is therefore left to competitive market conditions letting self-adjustment to happen following competitive environment to meet market demand. By so doing, commercialization, liberalization, regionalization and deregulation processes in tandem brought about combined positively outweighing result to the sector.

6.3.6 Relief transport operation

As a consequence to large relief transport operation, in the 1980's, the demand for relief cargo transport operation showed significant growth. It was then estimated to have a need of about 20-25% lifting capacity from the total ton k.ms of the country. The size and type

of operation required to have high-capacity trucks and services of dedicated units only for the relief transport operations. At the beginning, they had been operating independent of the market for relief cargo and only call private commercial operators for gap filling. The original objective of the relief fleet emanated from the fact that there was need to have a strategic fleet operator to supplement shortage of private trucks. However, later in 1993 to 1994, the relief fleet started to join back the market competing with commercial operators in transporting commercial cargo all-round the year. Gradually, associations, companies, enterprises, and individual operators, relief affiliated operators also started to take part all facing the challenge of competing for cargo in the market.

For relief operation, the demand and supply gap for trucks vary by season of the year due to effect on availability of return load. Seasonal variation indicates that there are slack season and peak periods which influence the tariff level. There was marginal variance, as related to demand and supply based competition, on the level of tariff rate applied. In fact, the tariff rates were highly tied up to the level of balance on availability of relief cargo and trucks by season of the operation. For transport operates, in the context of Ethiopia, availability of cargo is a factor in fixing the level of rates than the actual determining factor of vehicle operating cost to their operation. Trucks of government institutions, with very large fleet size, which were underutilized, were also contributing to the distortion of market price as they were allowed to enter into the commercial market. This created controversy, as most of them were not paying taxes, and creating unfair condition of competitiveness practices to regular commercial fleet operators.

6.4 Vehicle Registration and Composition

The responsibility of collecting vehicle statistics at national level is one of the duties and responsibilities of the Ministry of Transport and Logistics (MoTL). Country-based national vehicle registration statistics, compiled from regional transport agencies, as secondary data base and commonly used as source for traffic and vehicle fleet analysis. Motorized vehicle registration record refers to road worthy vehicle moving on the road, by mechanical or electrical power, wheeled motor vehicle other than special

military vehicles. Road worthy means vehicles registered and inspected annually following the inspection and registration procedure of the working system. Vehicle registration and licensing statistics, compiled by the MoTL, is used to analyze the trend, composition of vehicle fleet growth, distribution by region and national level, and type of ownership. According to the annual statistics of MOTL, the total number of road worthy vehicles registered and inspected, in 2021/22 (2014 Ethiopian Calendar), is recorded to be 1,401,114 vehicles.

The registration system is based on ownership and identification plate numbers classified into federal and regionally coded plates. The regional codes, including for the city of Addis Ababa and Dire Dawa, respective abbreviations identified. Codes such as AA stand to indicate vehicles registered in Addis Ababa, and DD for Dire Dawa to regional center for classified registration. The ownership identification of vehicles, as registered at federal and regional level; identified by different colors and usage codes. The colors and codes, except for temporary, transferrable and special mobile equipment plate, depicting the ownership dimension of the vehicle under consideration. Registered vehicles on the roads, as identified through the registration system broadly classified by type of service or carriage as bicycle, motor vehicle, semi-trailer & trailer. For analytical purposes, the following disaggregated data is used for trend analysis, composition assessment by type of vehicle, charts, service and center for registration.

Table 6.1 – Vehicles Registered and Inspected

Source: MOTL Information Communication Technology Directorate (2014 E.C. – 2021/22)												
Description	AA	AM	AF	BN	DD	SO	TG	GM	HA	SN	OR	Total
Ambulance	310	-	99	56	6	45	187	-	4	80	730	1,517
Automobile	260,027	2,038	95	58	2,413	648	1,994	-	1,303	109	7,122	275,807
Bajaj	-	12,646	5,071	-	3,302	-	-	1,553	4,909	12,901	80,668	121,050
Tri Cycle	-	-	-	-	-	-	-	-	-	-	-	-
Bus(< 12 Seats)	29,951	10,875	544	406	1,666	979	5,656	2,293	80	13,988	35,954	102,392
Bus(> 11 Seats)	18,602	16,448	785	586	860	871	4,473	927	3,000	15,359	49,019	110,930
Combiner	12,673	68	-	-	2	1	5	-	-	-	96	12,845
Dozer	-	1	3	3	-	1	4	-	-	-	-	12
Dry Cargo(<=10 Quintal	37,495	4,250	386	119	1,083	1,104	1,298	-	-	176	2,705	48,616
Dry Cargo(>10 Quintals)	62,196	4,186	294	123	4,670	2,604	5,148	-	-	233	10,144	89,598
Dual Purpose Vehicle	102,708	4,731	535	380	1,704	989	2,266	-	56	1,712	3,745	118,826
Field Vehicle	39,836	2,296	428	169	524	1,148	1,282	-	300	206	4,040	50,229
Grader	6,228	2	-	-	2	1	4	-	-	-	2	6,239
Forklift	33,933	-	4	1	10	1	18	-	-	-	2	33,969
Not Specified	37,208	1,801	79	57	327	511	397	-	-	2,540	2,836	45,756
Gotach	6,275	-	-	-	67	5	624	-	-	-	-	6,971
Liquid Cargo	7,133	368	43	2	244	186	658	-	-	67	228	8,929
Liquid Trailer	-	16	-	-	-	-	-	-	-	-	-	16
Motor Bicycle	10,487	54,446	1,600	9,764	8,111	1,651	14,405	2,853	1,076	85,630	78,370	268,393
Other	14,593	864	39	42	137	33	485	-	-	45	5,324	21,562
Three-wheel dry load	10,646	312	-	79	10	250	1,874	-	-	-	11	13,182
Three-wheel public load	-	15,342	-	3,817	-	8,523	16,647	-	-	-	-	44,329
Tractor	3,814	461	59	149	21	-	317	-	-	33	1,255	6,109
Trailer	5,972	423	9	1	450	1	2,913	-	-	1	505	10,275
Vehicle with Machinery	3,056	176	23	1	134	27	145	-	-	-	-	3,562
Total	703,143	131,750	10,096	15,813	25,743	19,579	60,800	7,626	10,728	133,080	282,756	1,401,114

Figure 6.1 - Vehicle registration and inspection by type of service and region

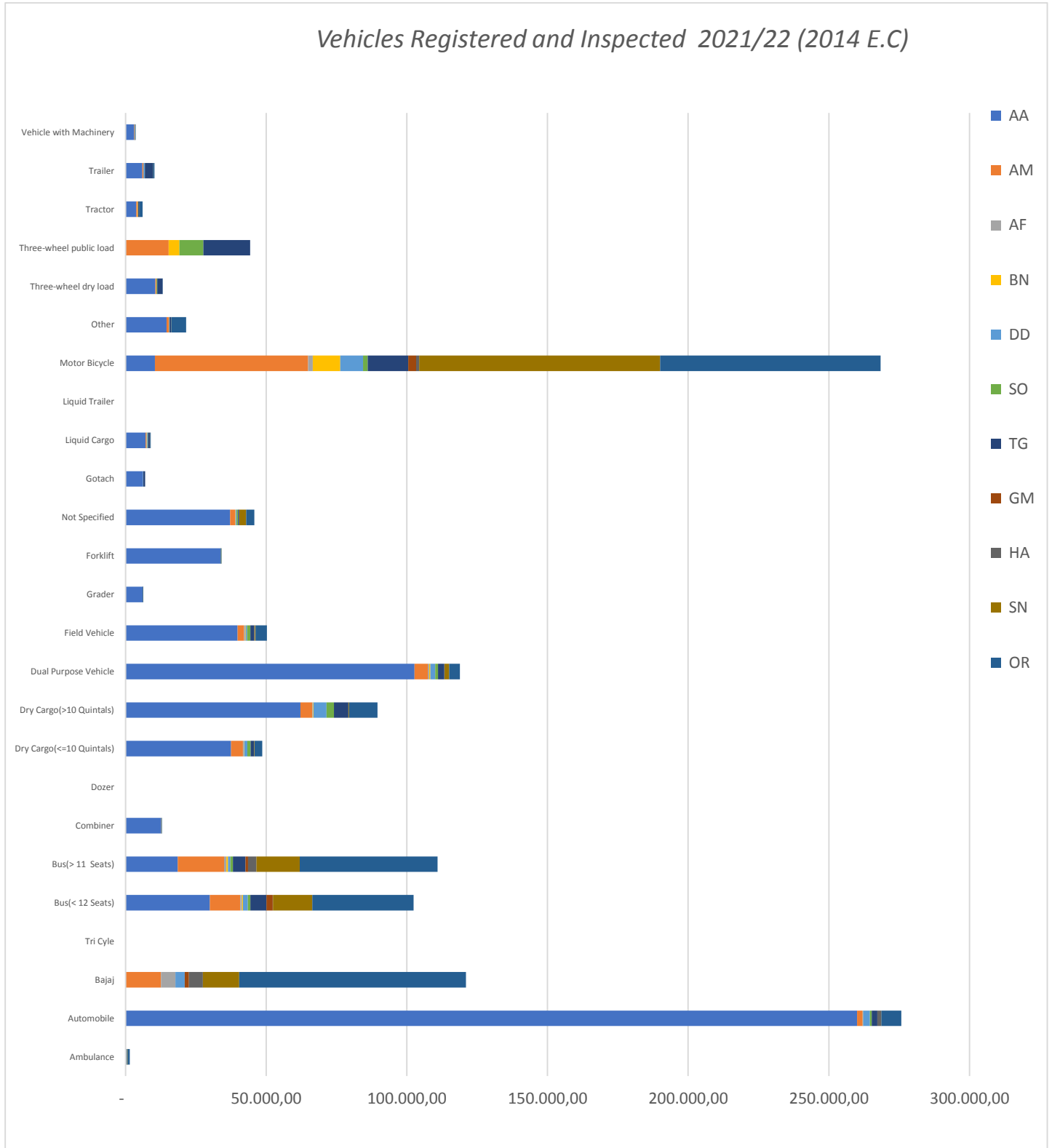


Figure 6.2 Vehicle registration by type of Service (Addis Ababa)

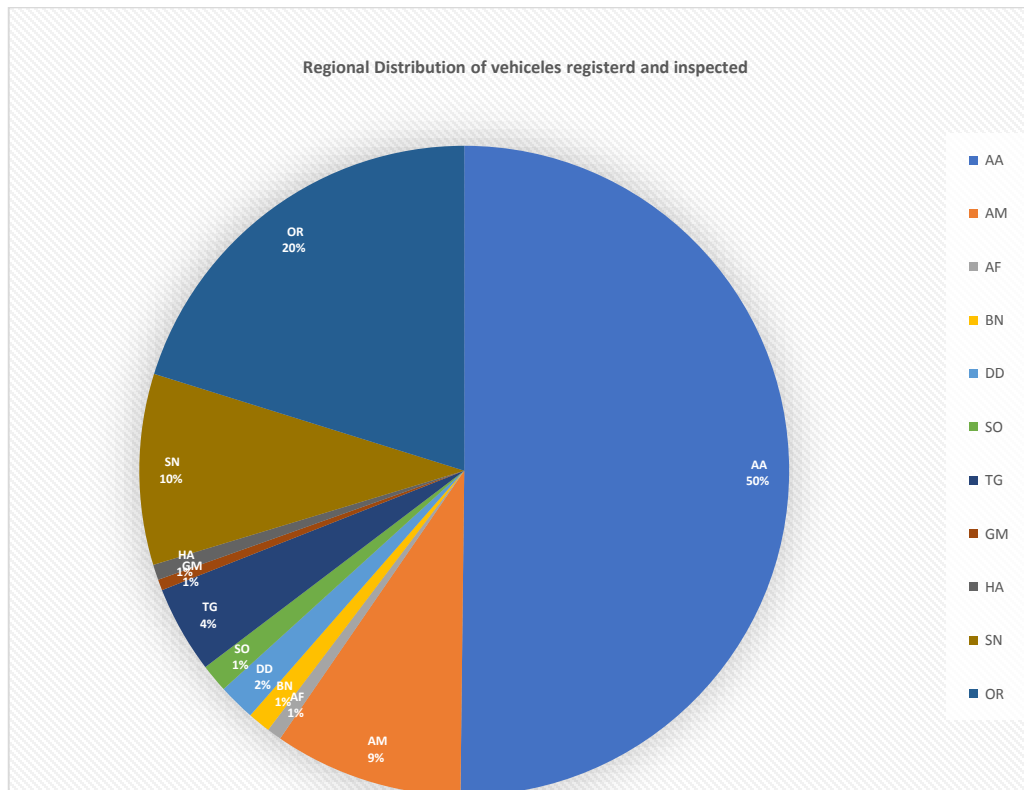
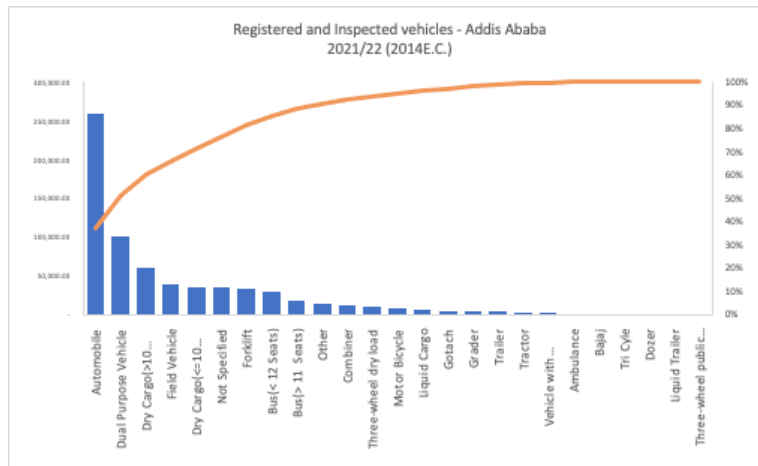


Figure 6.3 - Vehicle registration by regional distribution

6.4.1 Vehicle Distribution by region

Historical data on vehicle fleet trends showed that average vehicle growth in Ethiopia on average is about 10 percent per year and recorded to grow as high as 14 percent in a year. Currently, road worthy vehicles registered by the national system reached 1.4 million (2021/22). Road network usage by operational vehicle population in Ethiopia continually growing through time from low base. However, modern transport coverage still accounts only about 30 percent of the total demand for Transport. Apart from the Import-Export Corridor, and roads in city of Addis, very few roads are accommodating substantial vehicle traffic, with 10,000 vehicles per day (vpd) mark. The rapid increase of vehicles, though more than 50% of them are registered in Addis Ababa, show that the Ethiopian road network will gradually receive growing traffic volume to accommodate traffic.

Table 6.2 : Number of registered vehicles by region (2020)

Region	Addis Ababa	Amhara	Afar	Ben & Gumuz	Dire Dawa	Somali	Tigray	Gambela	Harari	SNNPR	Oromia	Total
No of vehicles	630440	106434	8277	10655	24510	19579	60800	6237	10728	118424	204026	1200110
- Heavy	255358	12615	1180	688	8028	4919	13382	0	56	6974	13389	316589
- Bus	46139	23150	1171	842	2442	1850	10129	2984	3080	22917	59604	174308
- Light	49140	1835	453	215	513	1193	1469	330	304	207	3475	59134
- Automobile	222683	1786	83	53	2360	648	1994	322	1303	98	5258	236588
- Others	57120	67048	5390	8857	11167	10969	33826	2601	5985	88228	122300	413491
Percentage	52.5	8.9	0.7	0.9	2.04	1.63	5.07	0.5	0.89	9.87	17	100

Source: Federal Transport Authority

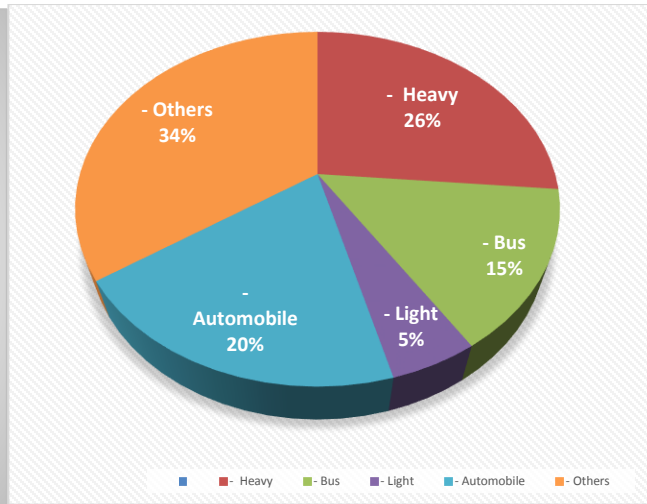
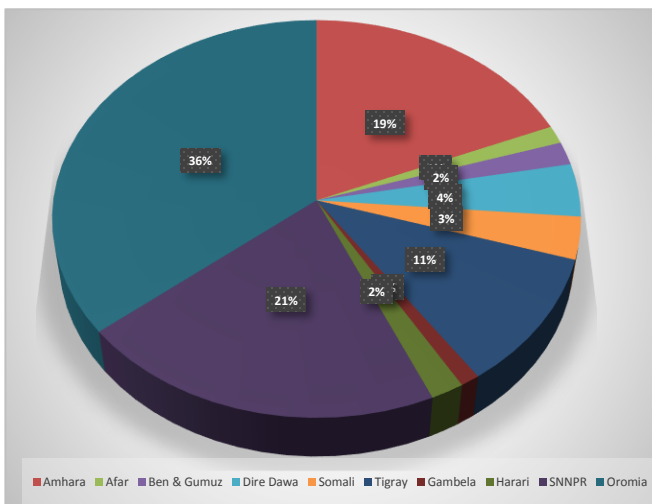
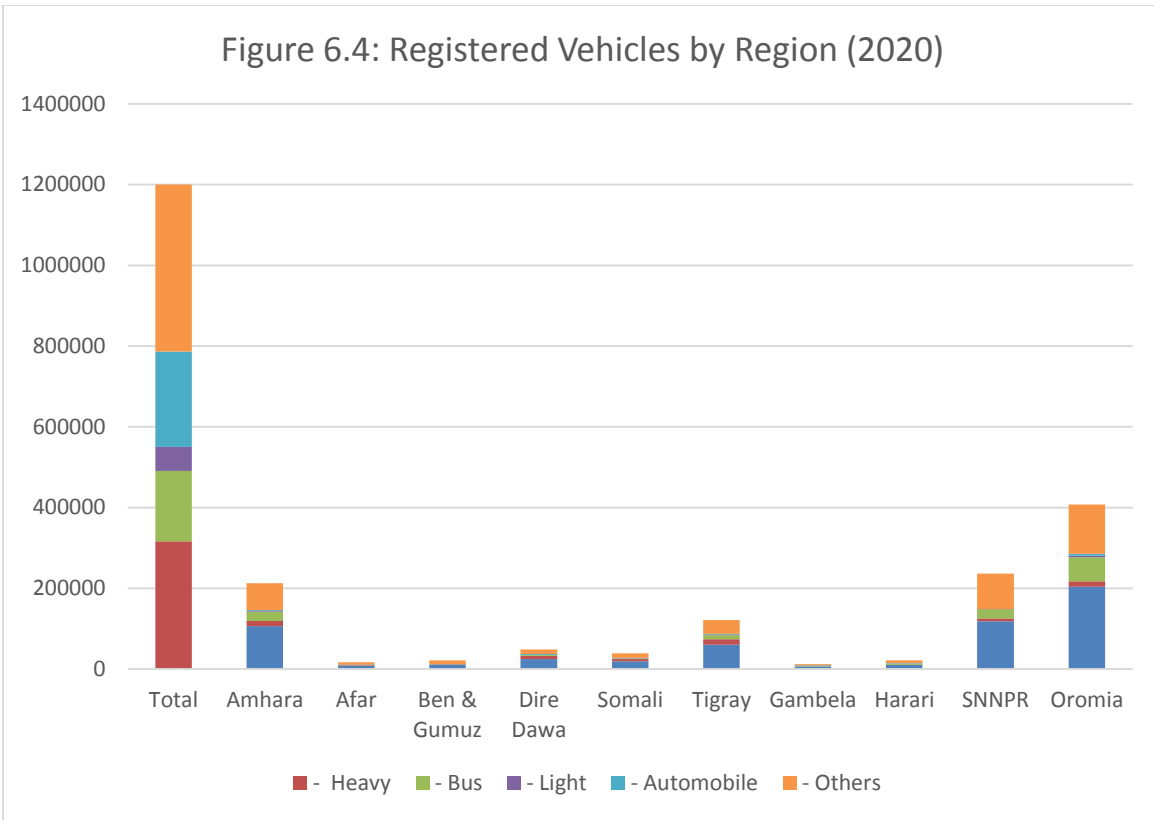


Figure 6.5 : Registered Vehicles by Region

Figure 6.6: Registered vehicles by Type

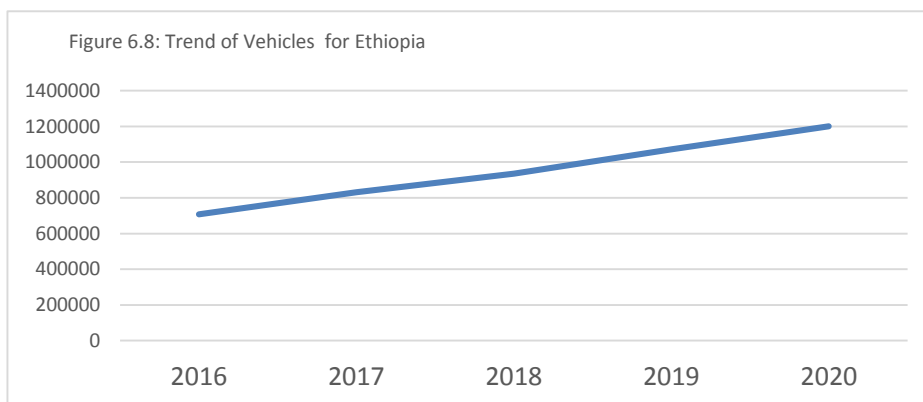
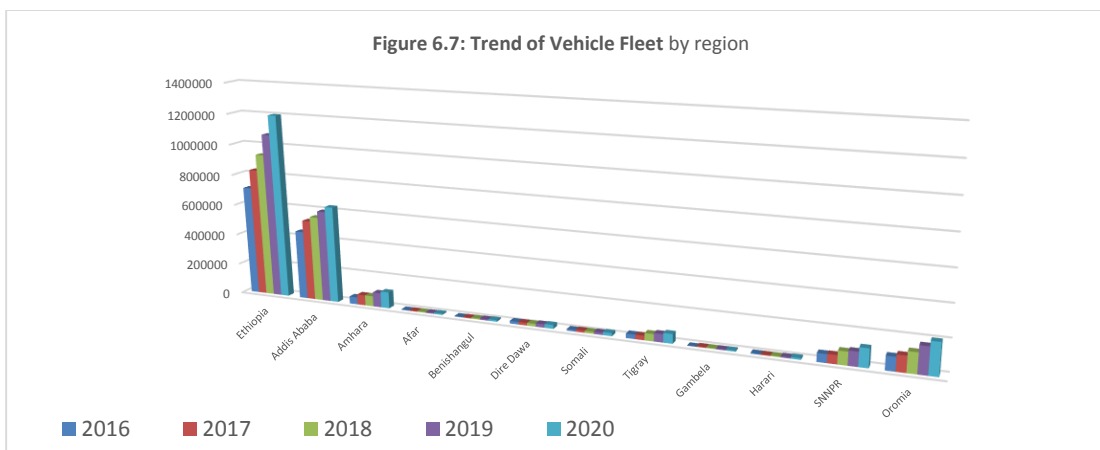
From more than 1.4 million vehicles registered in Ethiopia, in 2020, Addis Ababa takes 53% of the total registered vehicles; which is the largest stock of vehicles, followed by Oromia (17%) and SNNPR (10%). Referring to the increase between 2019 and 2020, the highest observed increase is in Harari (34%), SNNPR (30%) and Somali (29%). Between 2016 and 2020, again all regions recorded an increase of their stock of

vehicles with Gambela (67%), Oromia (23%) and Benishangul (23%) recorded the highest increases.

Table 6.3: Trend of Vehicle Fleet

	2016	2017	2018	2019	2020	Growth Rate(%) (2016 – 2020)	Growth Rate(%) (2019 – 2020)
Ethiopia	708416	831265	935888	1071345	1200110	12	14
Addis Ababa	447669	524444	553938	596084	630440	6	9
Amhara	47036	67299	67299	94001	106434	13	23
Afar	4592	5555	6137	6598	8277	26	16
Benishangul	4600	6025	7611	8842	10655	21	23
Dire Dawa	16951	17243	17924	21938	24510	12	10
Somali	10678	13294	13294	15160	19579	29	16
Tigray	28322	28322	45925	52751	60800	15	21
Gambela	788	5122	5122	5558	6237	12	68
Harari	5643	5643	5643	8000	10728	34	17
SNNPR	54090	55985	83656	91105	118424	30	22
Oromia	88047	102333	129339	171308	204026	19	23

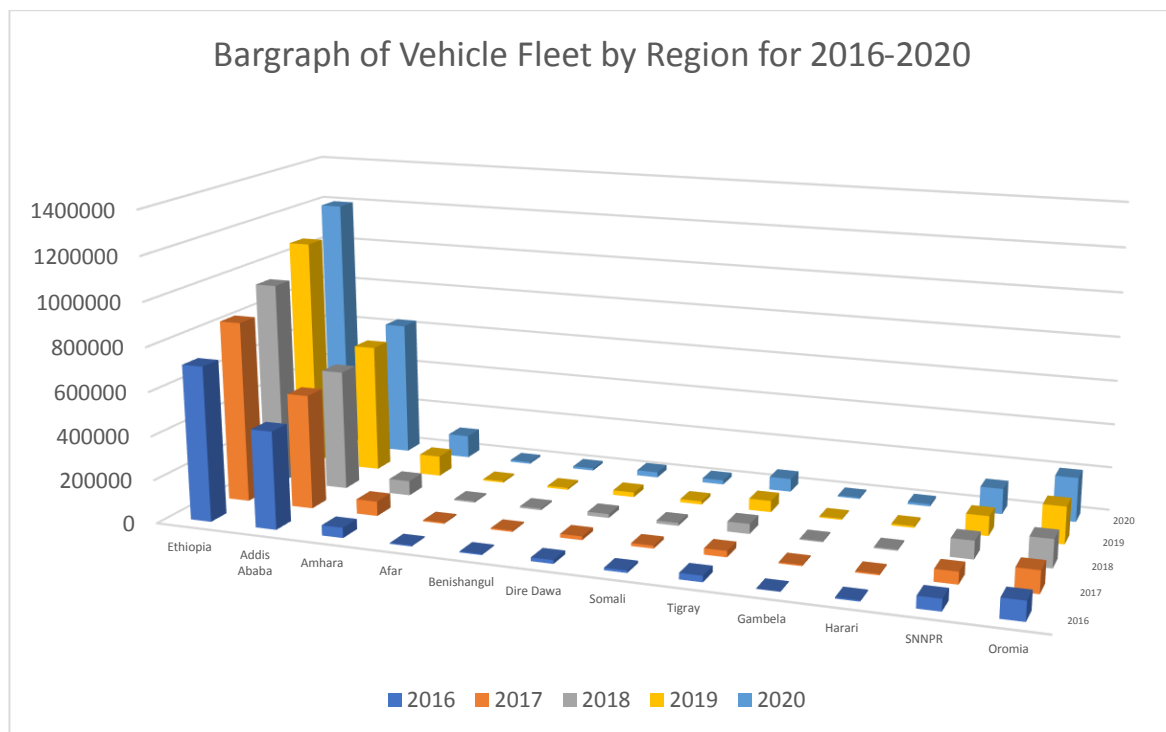
Source: Federal Transport Authority



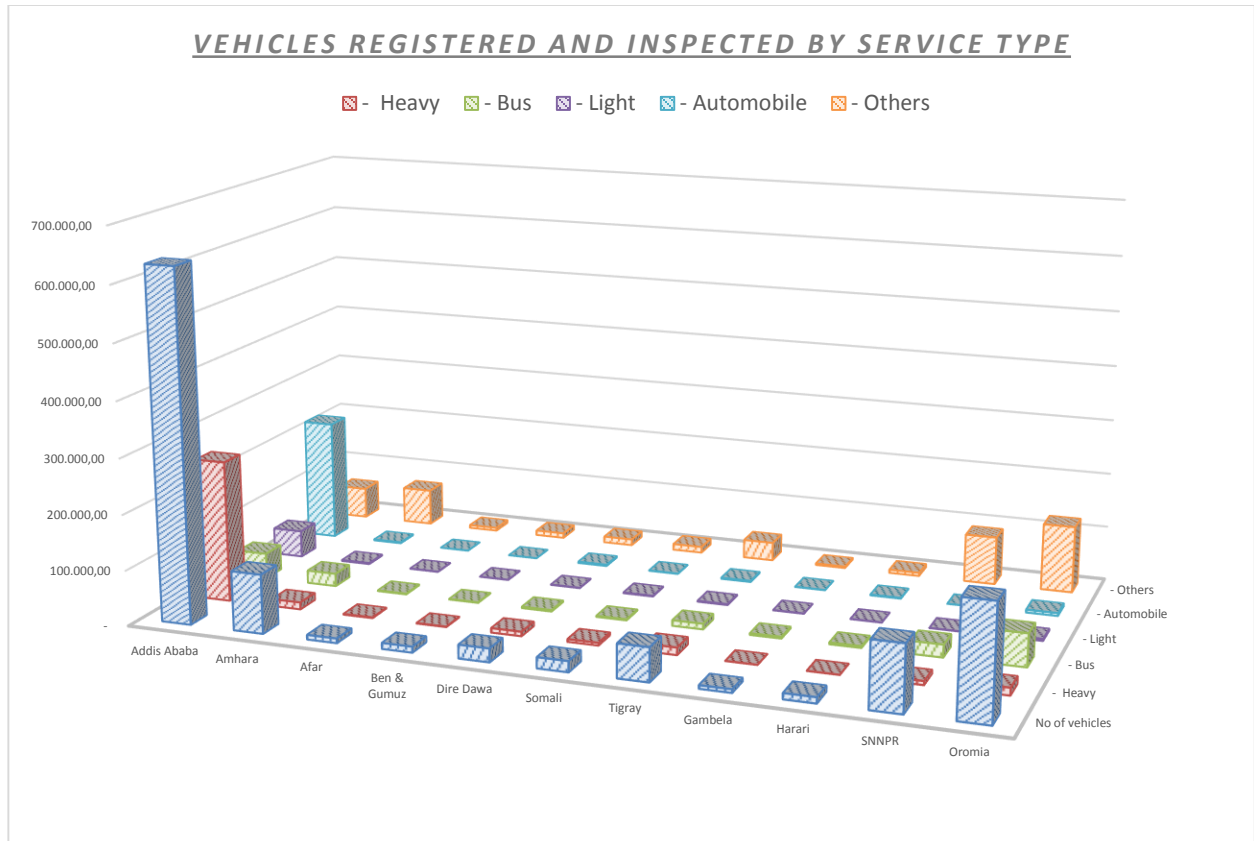
6.4.2 Vehicle Distribution by population

Ethiopia has an urban to rural population distribution ratio of 20% : 80%. Regional distribution of vehicles by size of population show uneven distribution by urban to rural ratio per thousand population. Urban to rural population and low level of urbanization, shows significant difference in level of distribution and show urban-centric motorization. It's variedly uneven both by ownership level and usage of motorized transportation. For instance, the number of registered vehicles in Addis Ababa, which accounted more than 50% of the total vehicle fleet the country, have a population size of less than five percent of total population. On the other hand, the rural population of the country, accounting more than 80% of population, have less than one percent of registered vehicles.

7



Graph 6.9 Total Number of Vehicles Registered and Inspected



Graph 6.10 Vehicles by type of service category 2003/04

However, starting from the early 1990's, the then transitional government introduced an incentive package to the private sector to allow import of high-capacity passenger and heavy-duty freight transport commercial vehicles to the country. There has been a suppressed interest for while on vehicle import which later turn to grow when the ban was lifted. Starting from mid of 1990's, there has been continuous growth changing the scenario with booming record level as high as 20 percent per year, increase of the fleet. As a result, over the fifteen-year period, the vehicle to population ratio growing from 1.19 vehicles per thousand population to 2.10 vehicles per thousand population.

Over the last three decades, the vehicle population of Ethiopia showed considerable increase faster than population growth rate. It was steadily growing at an average rate of about 10 % per year. Vehicle fleet of the country more than doubled in twelve years, from 1989/90 to 2003/04, growing from 59,238 to 145,807 vehicles. This was

despite that the then government banned import of private vehicles following the private car use restraint measure of the regime. However, it is not adequately spreading to the service demand of rural communities of the country. Vehicle to population densities are in the range of one to two vehicles per thousand population. Compared to international, or regional levels, it is by far low as the developed world is having almost a one-to-one vehicle to population density. Furthermore, the results will nearly be zero if measured against rural to urban population vehicle density measure. Disaggregated assessment on rural to urban population distribution nearly zero, indicating that motorized vehicle use in Ethiopia is largely urban centric.

Table 6.4: Total Number of Vehicles Registered and Inspected (1989/90-2003/04)

Year	No. of Vehicles	Percentage increase	Population "000"	Vehicles/1000 population
1989/90	59328		49831	1.19
1990/91	60576	2.10%	50504	1.20
1991/92	60769	0.30%	52016	1.17
1992/93	64520	6.20%	53584	1.20
1993/94	69719	8.10%	53477	1.30
1994/95	83279	19.40%	56404	1.48
1995/96	91457	9.80%	58234	1.57
1996/97	96502	5.50%	59750	1.62
1997/98	102883	6.60%	61266	1.68
1998/99	105850	2.90%	62782	1.69
1999/00	112222	6.00%	64118	1.75
2000/01	118732	5.80%	64317	1.85
2001/02	126060	6.20%	65989	1.91
2002/03	132938	5.50%	67705	1.96
2003/04	145807	9.70%	69465	2.10

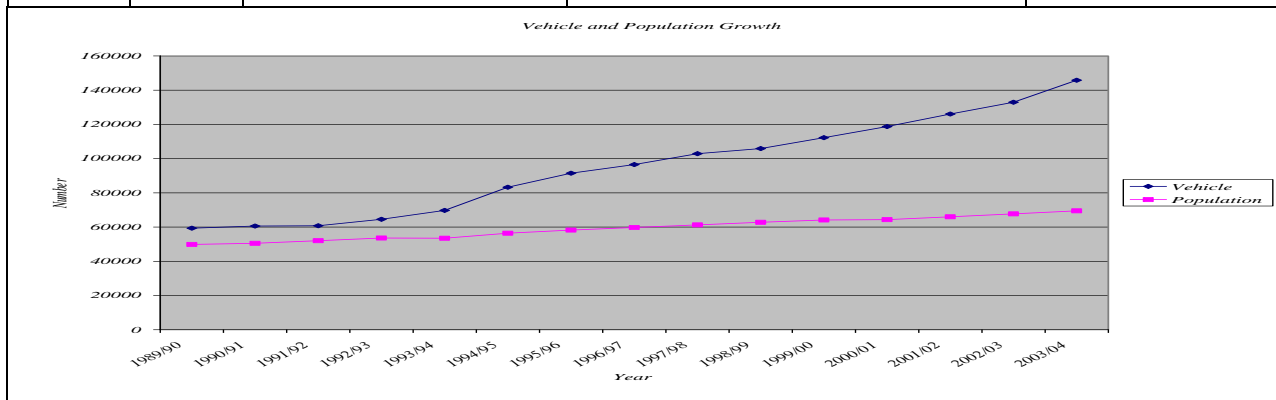
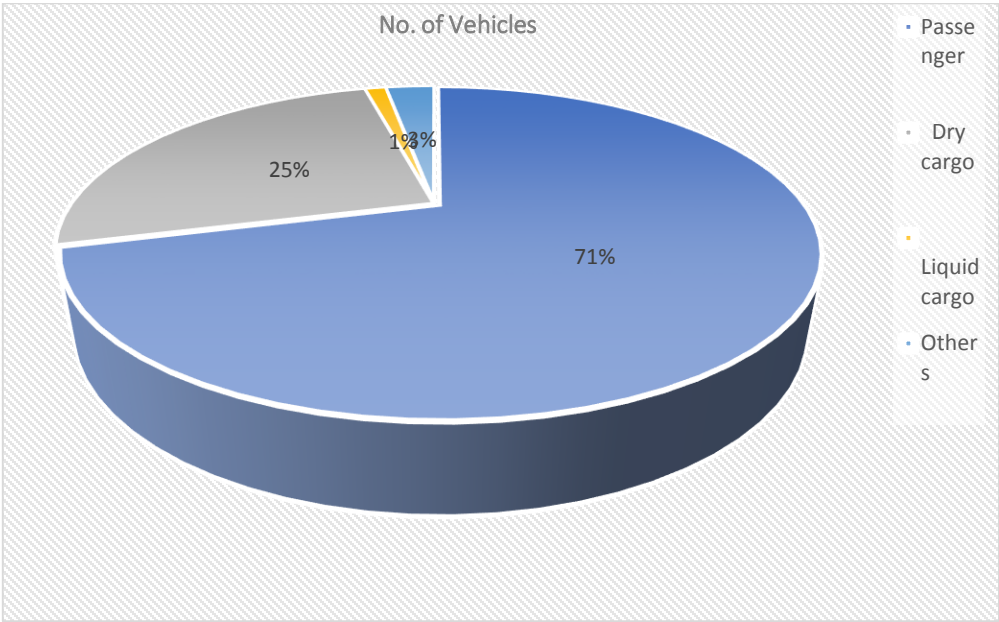


Figure 6.11: Trend of Vehicle and Population growth

This was happening despite that the then government system banned import of private new vehicles to the country. It's cited as one factor for shifting to old vehicles and the market supply diverted to importation of old aged cars. The intention was to discourage private car use, classified as luxury item, which was also a reason for shifting to lower horse powered range of old cars. For sake of affordability, due to high excise and customs taxes, preference goes to low tax-based models. This is a forced diversion which encouraged importers to take the option of importing old cars with lower range cylinder capacity. New ones with high cylinder capacity could only be imported at unbearably high tax rate (going up to 250%), which in a way totally discouraged importation of high-powered new vehicles to the country.

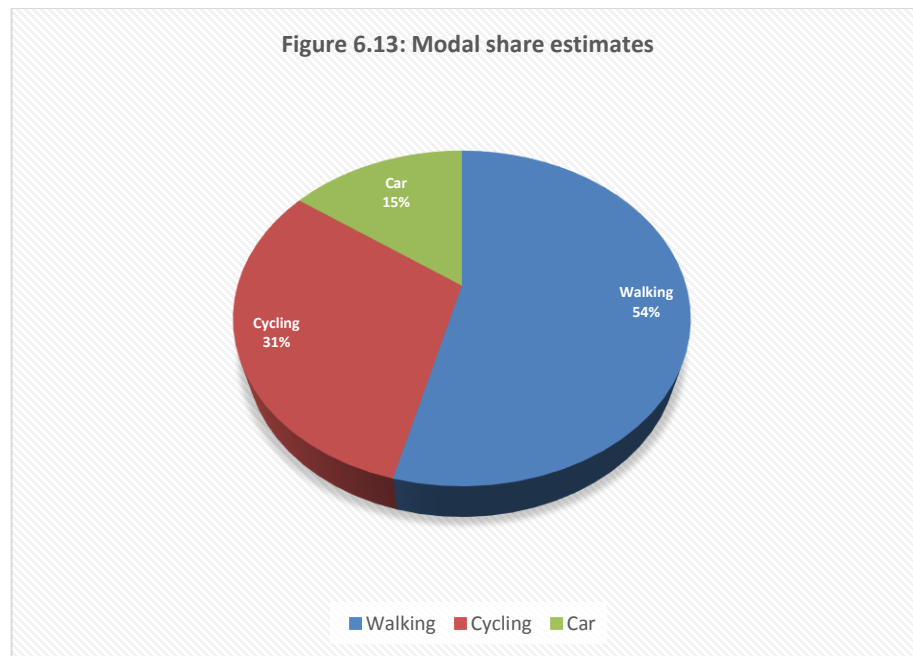
Figure 6:12: Share of Vehicles by type



6.4.3 Motorization and Distribution

Rural areas widely use non-motorized transport for their mobility need and goods transport. In this regard, the MoTL Ethiopia Non-Mortised Strategy 2019-2028 states “Ethiopian cities and rural centers are characterized by widespread use of non-motorized modes. Walking is a dominant mode, particularly for low-income groups who travel mostly by foot. In spite of a dramatic increase in motorization in Addis Ababa, the largest share in the capital city among modes of transport is still walking

(54 percent), followed by public transport (31 percent). Private cars make up the smallest share of 15 percent. In many small towns and secondary cities, such as Bahir Dar, Hawassa, Nazareth, and Dire Dawa, cycling makes up a large percentage of trips. For instance, in Bahir Dar and Hawassa, cycling accounts for 90 percent and 88 percent of vehicle trips, respectively.”

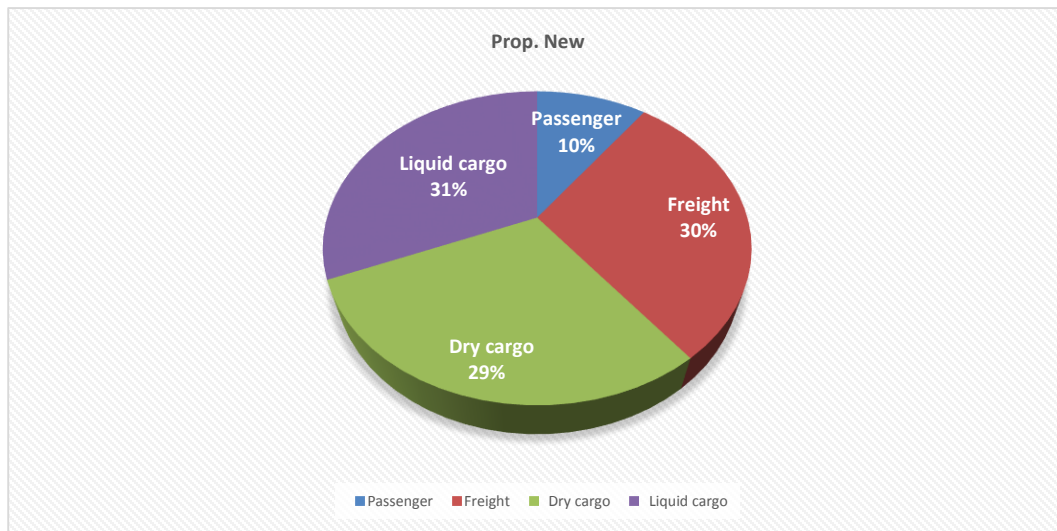
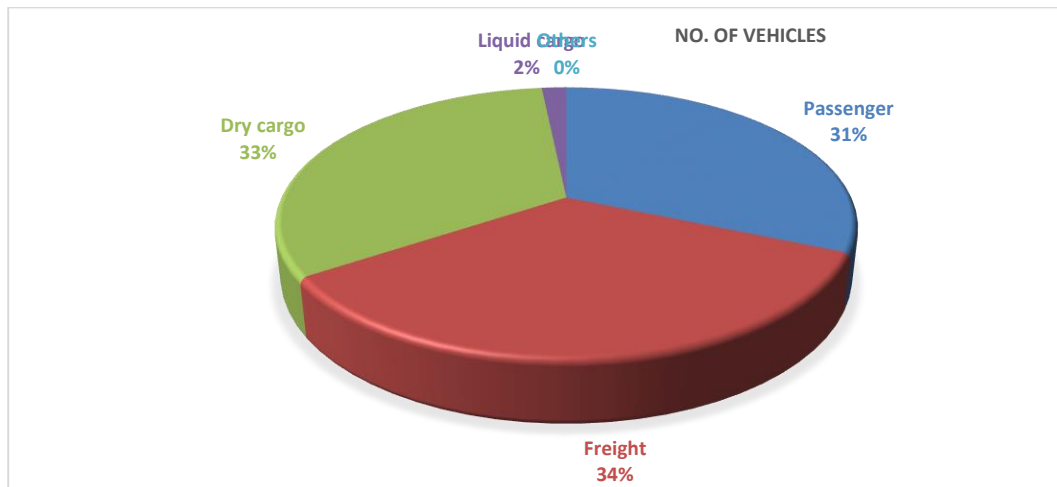


6.4.4 Vehicles registered by service type

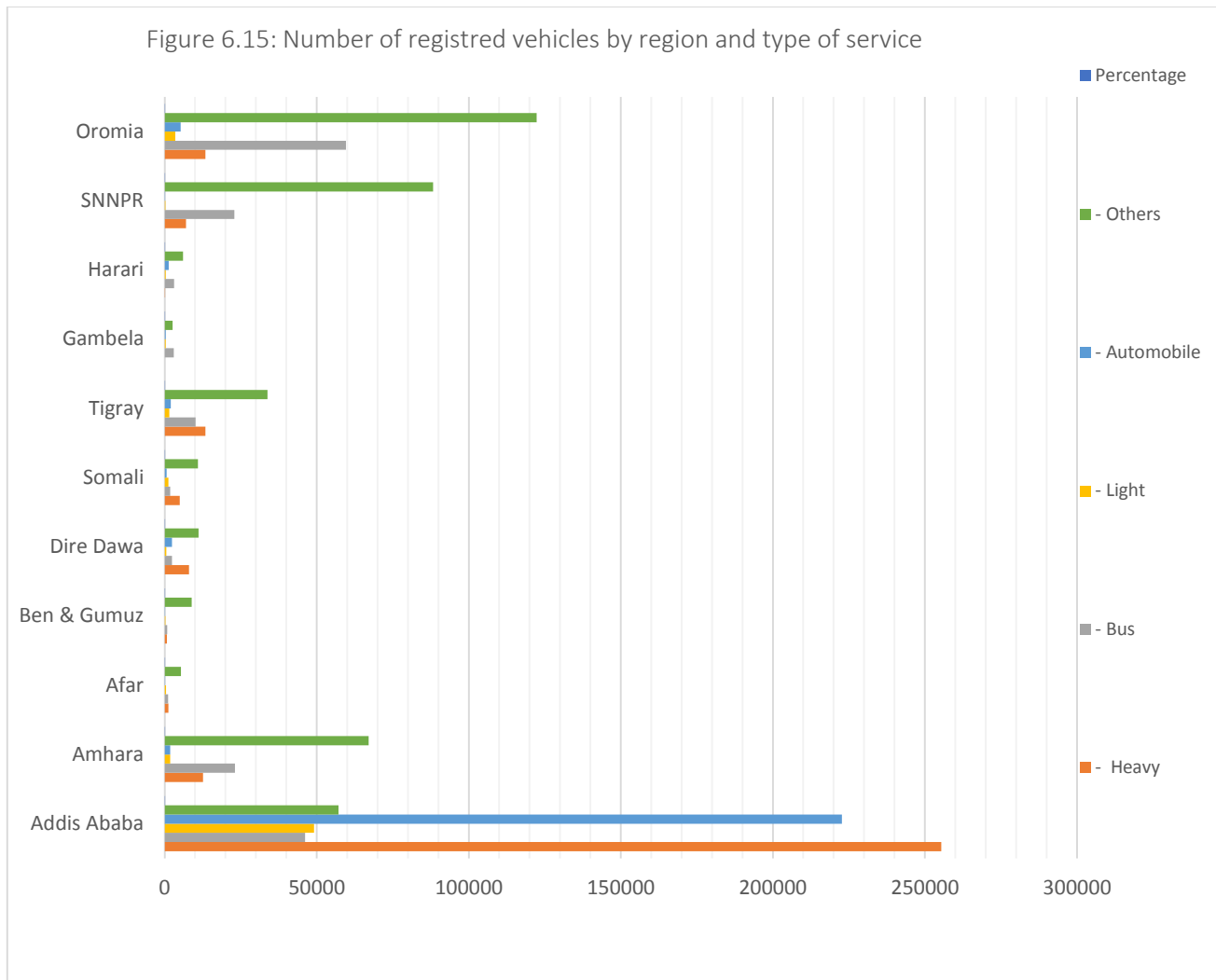
Registered vehicles groupings classified based on capacity classes of passenger vehicles, freight vehicles, motorized two wheelers, earth moving construction and special equipment’s. At national level, passenger transport vehicles account about 70% from the total vehicle fleet registered in 2003/04. Freight vehicle account about 26%, out of which 25% are dry cargo and remaining one percent liquid cargo. Figures show lateral numbers with no reference to capacity, in terms of number of seat or freight lifting capacity. Based on the annual vehicle inspection data for the year 2021/22, the fleet summary by service category shown on table below.

Table 6.5 *Vehicles by type of service category*

Type of Service	No. of Vehicles	Percentage	No. of new	Prop. New
Passenger	103,360	70.89	6,460	6.25%
Freight	38,462	26.38	7,047	18.32%
Dry cargo	36,724	25.19	6,709	18.27%
Liquid cargo	1,738	1.19	338	19.45%
Others	3,985	2.73%	-	-
Total	145,807			



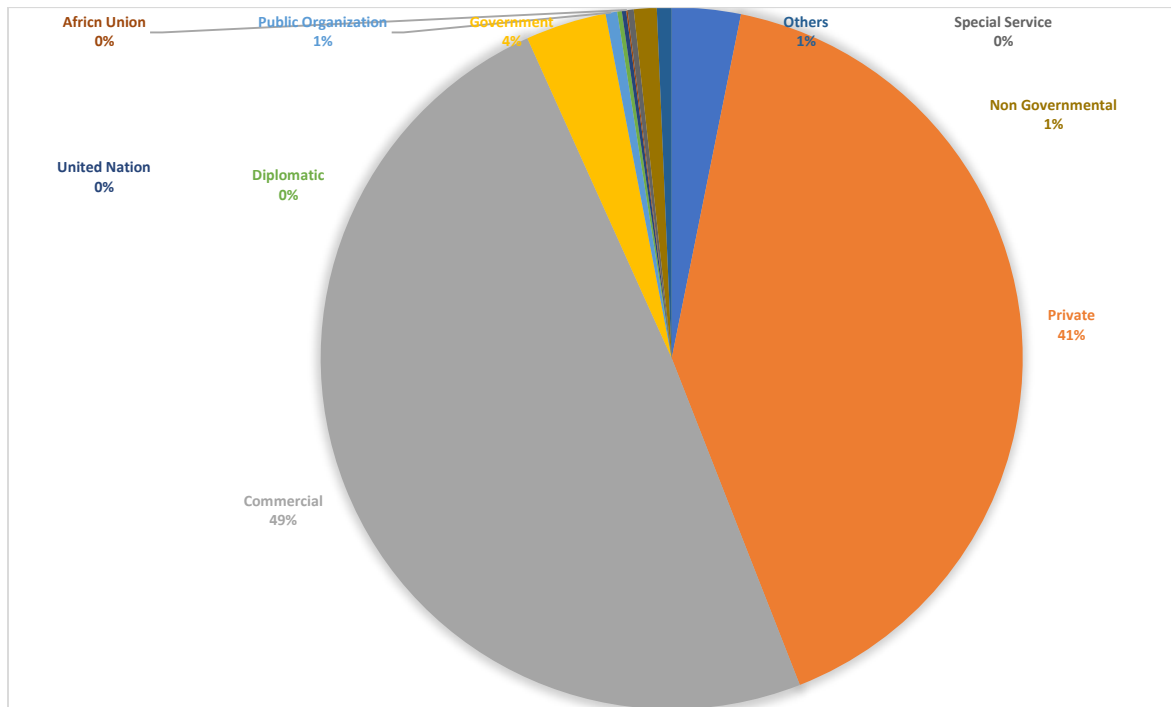
Graph 6.14 : Registered Vehicles by service type



6.4.5 Vehicles by ownership type

Privately owned vehicles account about 41% of the fleet and non-private use commercial vehicles about 49 % of the vehicle population. The incentive given to import commercial vehicles contributed to the increase in number and capacity of commercial vehicles. Vehicle ownership indexes, with respect to the respective size of population rates, are compared using a time series data base for the registered vehicles. National aggregate indicators for the vehicle ownership rate are very low both by international and regional standards. With time the national estimates are showing marginal increase in ownership rate over the last few years. In general, the rate of vehicle growth is faster than the rate of population growth.

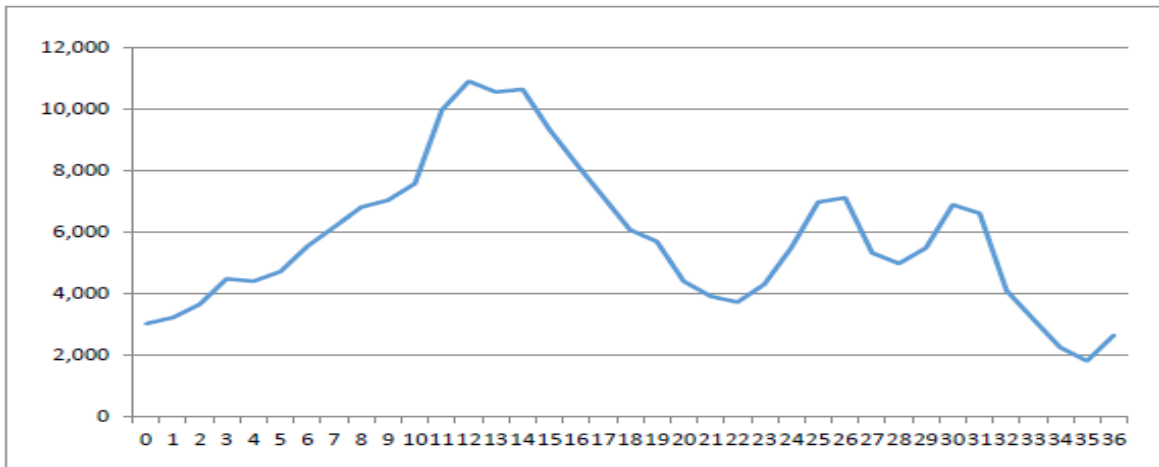
Figure 6.16: Registered vehicles by ownership



6.4.6 Vehicles by age group

Up until recently, there was no control and restriction on age of imported vehicles, and hence unsafe and old aged vehicles imported to the Ethiopian automotive market. In Ethiopia, motor vehicles imported from various countries in Asia, Europe, and the United States. In Ethiopia, large majority of vehicles are old aged and dominantly used for commercial purposes. Large majority have high fuel consumption rate which negatively impact fuel efficiency and the environment. The other vehicular data analysis is based on age group of vehicles by service type, which is related to classification based on their plate codes. It's assumed that codes have direct reflection in service type though not all have same category of service. The assessment will help to through some light on impact of old age of vehicles having direct impact to level of fuel consumption. Current move on aged vehicles is in the direction of phasing out older vehicles. This requires having in depth assessment on level of consumption pattern of old vehicle in use in the country.

Figure 6.17: Age Profile of Vehicles

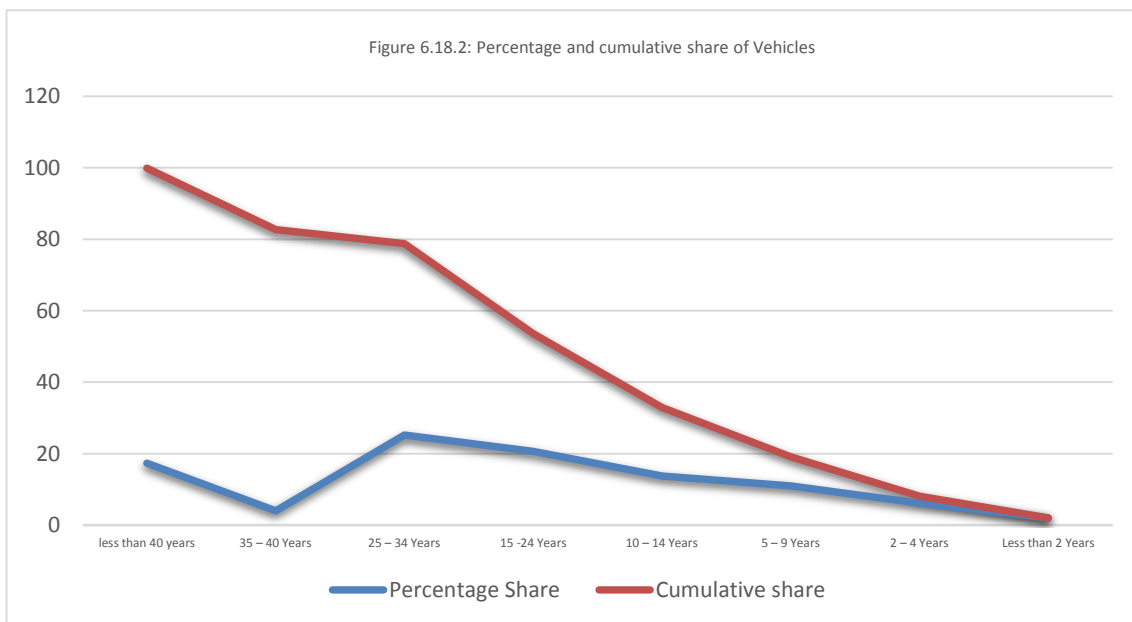
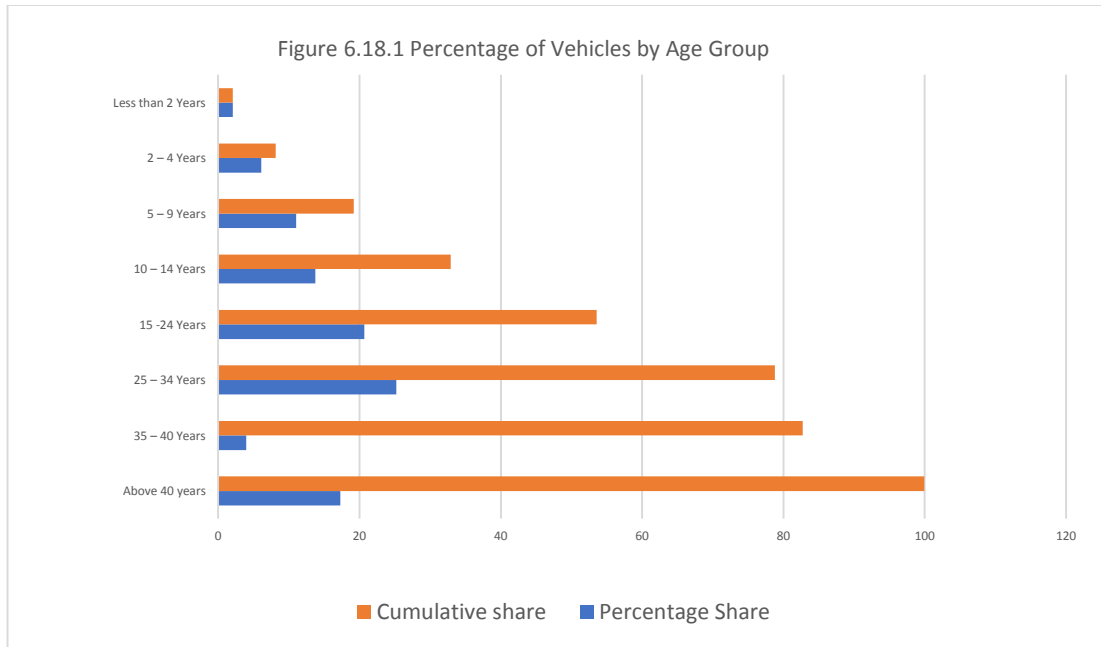


Considering the age profile of about six hundred thousand vehicles, the analysis by age group reveals that there are about 54 percent of vehicles with more than 25 years of age, while only about 8.2 percent of vehicles are with less than 5 years of age. Vehicles less than ten years comprised of about 20% only. The analysis indicated that the vehicle fleet is highly skewed towards overaged, and non-road worthy very old vehicles. Old age vehicles negatively contribute to having high cost of operation. With high proportion effect on generalized cost, resulting from increase on vehicle operating cost, expressed by high maintenance cost, inefficient fuel and lubricant utilization, emission to the environment and contributing to traffic accident.

Table 6.6: Percentage of Vehicles by Age

Year of Service	Percentage Share	Cumulative share
Above 40 years	17.30	99.93
35 - 40 Years	3.96	82.73
25 - 34 Years	25.20	78.77
15 -24 Years	20.66	53.57
10 - 14 Years	13.74	32.91
5 - 9 Years	11.01	19.16
2 - 4 Years	6.11	8.15
Less than 2 Years	2.04	2.04

Figure 6.17: Percentage of vehicles by age group



The vehicle data summarized on table below exhibits old-aged vehicles registered under the code 3 category (Commercial vehicles) and category 2 (Private vehicles). Focus on those vehicles registered under commercial and private vehicle category, would help to make appropriate policy review for positive contribution in reducing the variable part of transport operating cost, environment and thereby increasing efficiency of the transport operation.

Table 6.7: Vehicle by Age and Registration Code (in Percent)

	Code 1	Code 2	Code 3	Code 4	Code 5	Others
>40 Years	5.87	39.08	50.26	1.62	0.53	2.63
35 – 40 Years	30.28	41.91	26.24	0.97	0.27	0.33
25 – 34 Years	1.88	53.45	40.97	2.08	0.53	1.09
15 – 24 Years	0.99	53.79	41.37	2.21	0.49	1.15
10 – 14 Years	0.54	36.13	54.01	4.89	0.59	3.85
5 – 9 Years	0.24	18.02	65.12	11.09	0.65	4.88
2 – 4 Years	1.82	10.98	77.22	5.48	0.50	4.00

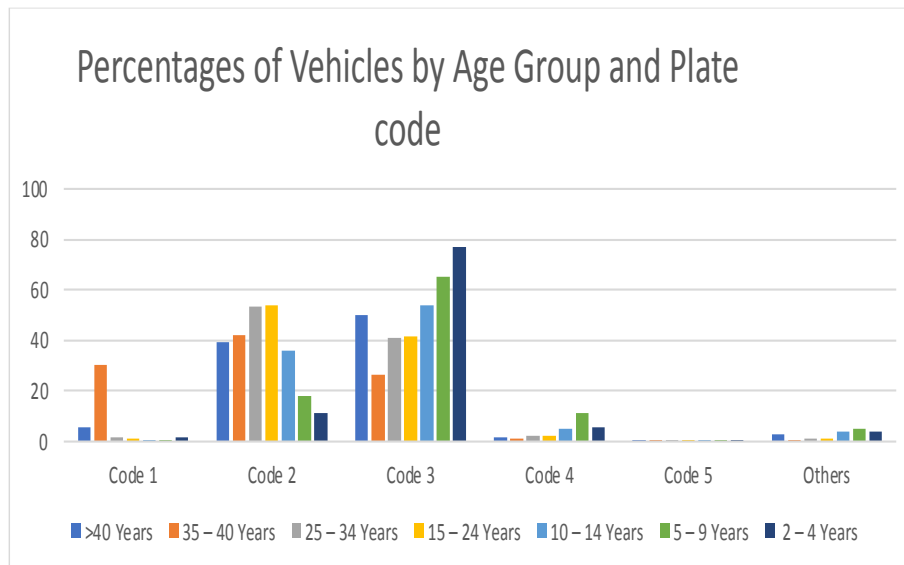
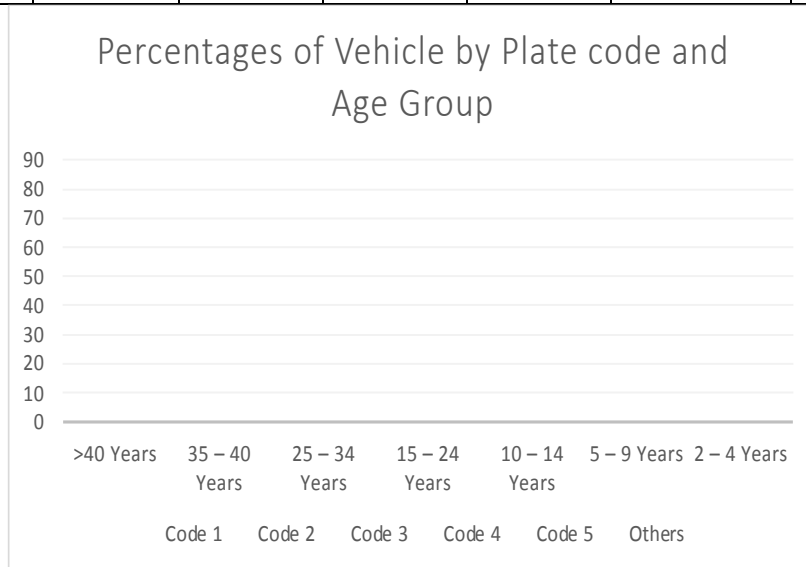


Figure 6.18.3: Percentage of Vehicle by plate code and age Group

CHAPTER SEVEN

7 Assessment of Urban Transport and Mobility

7.1 Background

Economic growth potential of cities can be ensured through the development of efficient, effective and dependable urban transport and mobility management system, and urban transport is the backbone of the socio-economic activity in cities. It's a prerequisite to ensure sustainable development, and a determining factor for growth and development of cities. Over the last few decades, cities witnessed steady economic growth in response to unprecedented urbanization, manifested by uncontrolled urbanization sprawl, in addition to growing urban population and motorization. In emerging cities of most African countries, however, sustainable development policies either are not in place, or has not been well practiced. Development of sustainable urban mobility policies, and integrated approach on intervention strategies, strongly promote use of public transport in reaching the urban dwellers.

Cities and urban areas need to develop responsive urban transport and mobility policies and strategies to sustain their expansion. However, they have challenges of rapid urbanization in many instances due to uncontrolled urban sprawl; which is leading to inefficient cities, congestion and hugely unsatisfied transport supply to demand gap. Cities growing in a haphazard way leading to growth in the informal way. As a result, the poorest communities usually settle far away from economic opportunities, and social amenities. Lack of coordination between land-use management and transport planning in particular having negative effect on demand responsiveness of urban transport and mobility need of the poor segment of urban population. Cities, therefore, are required to sustain the pace of higher economic growth.

7.2 Factors of Urban Transport and Mobility

Following the country's Growth and Transformational plan, Ethiopia is in the course of implementing an economic development strategy manifested by the construction of transport demand generating grand projects, and investment programs. Over the last few years, the country heavily invested on urban infrastructure and services improvement in response to the increasing demand for urban transportation. Despite the efforts for transport development, there is growing concern on supply side shortcomings and hence low level of accessibility on the urban transport system. The urban transport facilities in regard to the infrastructure's development, including rolling stocks, fall short of meeting the growing demand. The system is characterized by limited road network, poorly organized service provisions, huge unmet suppressed demand, short of supply to demand, and low motorization rate.

On the other hand, cities faced unprecedented urban population growth, uncontrolled urban growth and the resultant effect of urban sprawl leading to citizens moving to new housing locations in the outskirts of the city and suburban areas. For instance, in an effort of providing public transport services, the Government developed and implemented a mass transit system in the city including Light Rail Transit system (LRT), which was the first of its kind in sub-Saharan Africa. Despite that there is poor traffic management and control system, and poorly organized parking management system, leading to unregulated on-street parking which is a cause for consequential congestion. Poorly organized traffic management and control is a challenge besides to being a cause for high rates of road accidents. Unless addressed timely, the challenge will further be aggravated as vehicle fleet increase in urban areas.

7.2.1 Socio-Economic Aspects

Rapid rate of urbanization, population growth, and increasing trend in motorization poses major challenge for the country in matching up to service provision and infrastructure development. If something is not done, in good time, the problem aggravates as the urban population nearly triple within the next two decades.

Population projections, within the next thirty years, reveal that sixty percent of all Africans will start to live in urban areas, and there will be an additional 300 million urban residents in Africa by 2050. Urban population growing at around 4.5 percent per year in most primary cities of Africa.

Figure 7.1: Selected African Cities Population Growth

City Population Growth, Africa (1950-2015)



With limited resources, and low level of gross national income (GNI), fast growing urbanization, coupled with growing population, turn to be a major challenge for cities development and management. This requires providing adequate infrastructure, urban services, housing and opportunities to generate from the countries limited resources. Proper management of urban development is not only essential, but also a necessity to sustain economic growth and to improve citizens' quality of life. Over the past phases of urban development program, the country exercised major economic and social transformation programs bringing about high rates of economic growth, and achievements in terms of the country effort to reduce poverty in both urban and rural areas.

The Ethiopia Urbanization Review (World Bank, 2015) indicates that the rate of urbanization will be even faster, with a tripling of the urban population by 2034. Ethiopia is 18 % urbanized, with US\$470 GNI per capita, Atlas method. With US\$470 GNI per capita, using a poverty line close to US\$1.25/day, Ethiopia has the eleventh lowest per capita income in the world. Ethiopia is from among the countries that have made fastest progress on the Millennium Development Goals (MDGs) and Human Development Index ranking over the past decade. In view of such improvements, the country is determined to make urbanization an opportunity to become a middle-income country. One of the strategic pillars of the country is striving for “proactively managing the ongoing rapid urbanization to unlock Ethiopia’s potential for sustained rapid growth and structural transformation of the economy”. In this perspective, building informed urban transport and mobility strategies is most important to effectively contribute to the national effort.

7.2.2 Urban Population

With estimated population of 120 million, Ethiopia is the second most populous country in Africa, next to Nigeria. The total population is expected to reach 130 million by 2025. By 2050, Ethiopia will most probably be ranked among the ten most populated countries in the world. Out of the total population about one in five, about 24 million, living in Cities and Urban areas. It is one of the strongest urban population growth rates in the world, whereas the vast majority of 75 percent living in rural and sub-urban areas of the country. Though it has more than doubled over the past two decades, however, the current urban population in Ethiopia is one of the lowest in Africa (20%).

Following the fast-increasing trend of urbanization, the relatively low urban population, however, is expected to show dramatic increase in coming years. As a result, the population living in urban areas, by the year 2025, is estimated to reach 27 million (about 27 percent) from its current level of 20%. As a result, like many other African countries, cities will be faced with major challenges in meeting urban transport and mobility needs of their citizens. According to official figures from the Ethiopian Central Statistics Agency,

the urban population is projected to nearly triple from 15.2 million in 2012 to 42.3 million in 2037.

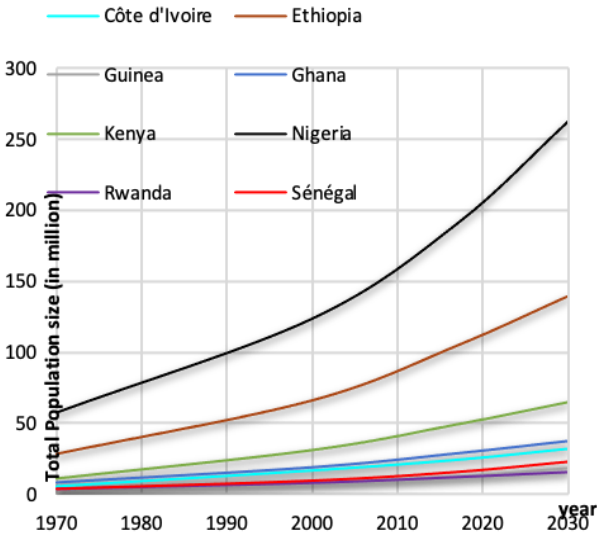
7.2.3 Addis Ababa as a primate city

With estimated population of about 3.3 million inhabitants (population projection of CSA), Addis Ababa is a primate capital city of Ethiopia. Most of the regional center cities, urban areas and small towns, located on the country's primary transport routes, have a population size less than five hundred thousand. The second largest being Dire Dawa (with 450,000 population in 2020), and the bulk of Ethiopian urban areas have less than 100,000 people. Overall, it is to be noted that more than 80% of the country's population live in rural areas, not in cities. Ethiopia is still less urbanized than most African countries. Ten years ago, the urban population in 2012 was estimated at only 17.4%, while the average urban population in all other countries of the world was 52%; out of which about 50% in middle-income countries, and 37% in Sub-Saharan African countries.

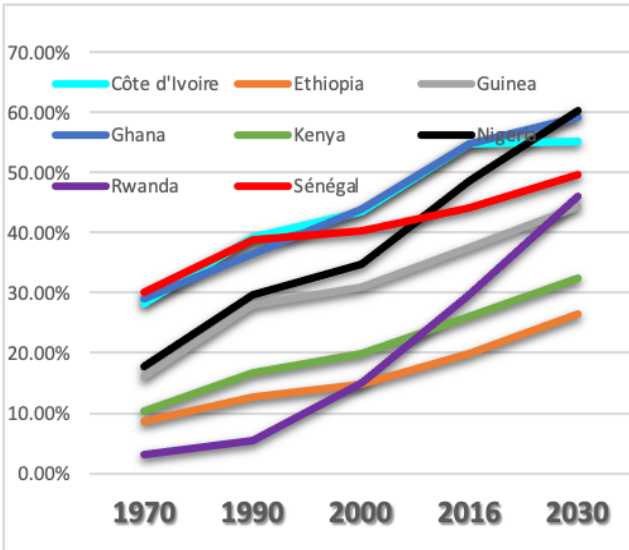
Urban Transport problem already hampering the movement of people and goods in many cities and urban areas. Currently, the service levels are too low to meet current need, and there is unprecedented fast-growing demand. On the other hand, the existing transport system causing huge toll due to road traffic accidents and seen as major health concern. One of the most visible negative effects of this situation is poor road safety mainly affecting the vulnerable group. Pedestrians, many of whom are poor, are the most at risk. Besides, urban transport problem of cities further aggravated by negative effects to the environment, social and safety risks. Providing sustainable response to the demand for mobility in urban areas is an urgent, and alarmingly growing concern.

The graphs below shows the total and urban population growth of eight countries in Africa over a period of fifty years (1970 to 2030).

Figure 7.2 : Total population by size and Urban Population ratios in Eight countries



7.2.1 : Total Population Size



7.2.2 : Urban Population percentages

7.2.4 Road accident

Road accidents in Ethiopia is one of the highest and a series concern for all stakeholder groups. Fatality rates are at about 64 people per 10,000 vehicles annually, which is one

of the highest in Africa. It's effect more sievior than others especially to the vulnerable groups. Out of the total accident rates about 60% of all serious crashes, and 73% of all road traffic crash-related fatalities affect pedestrians. According to the 2014 Household Mobility Survey, the poor comprise over 70 % of pedestrians, and are therefore disproportionately vulnerable to these high accident rates; about 85 percent of fatal accidents are attributed due to driver error and 6% due to vehicle defects.

7.3 Situation of Urban Transport and Mobility

7.3.1 Institutional and Governance

Ethiopia's constitution, in 1995, created a highly decentralized federal structure which fundamentally shifted out of a highly centralized system. Ethiopia has three main government levels of federal, regional, and local. The federal government mandate is to regulate the sector and transport policy development in guiding the sector. Regional governments create their own local government structure, and local governments have the responsibilities of managing city administration and municipal functions. Set up of urban transport management, generally in the country, structured within the respective region having defined mandates on their roles and responsibilities. The legal framework for urban transport in Addis Ababa is specifically defined by Law No 43 November 13/2014, which established the AARTB and described functions of the Bureau and departments. As per Article 23 of proclamation no. 691/2003 E.C, the Ministry of Transport acts as regulator and responsible body for transport policy formulation.

On the operational front, the public transport enterprises like Anbessa, Sheger and the LRT are public operator. They are , controlled by the City Government of Addis Ababa and ERC, complying with federal laws and regulations applicable to public enterprises. However, there is a noticeable overlap of responsibilities in sharing the operational and regulatory functions of the transport sector services and activities. The Ministry of Transport and Logistics supervises the development of the urban transport sector at national level. It has now been reformed to have new vested power of the former Federal

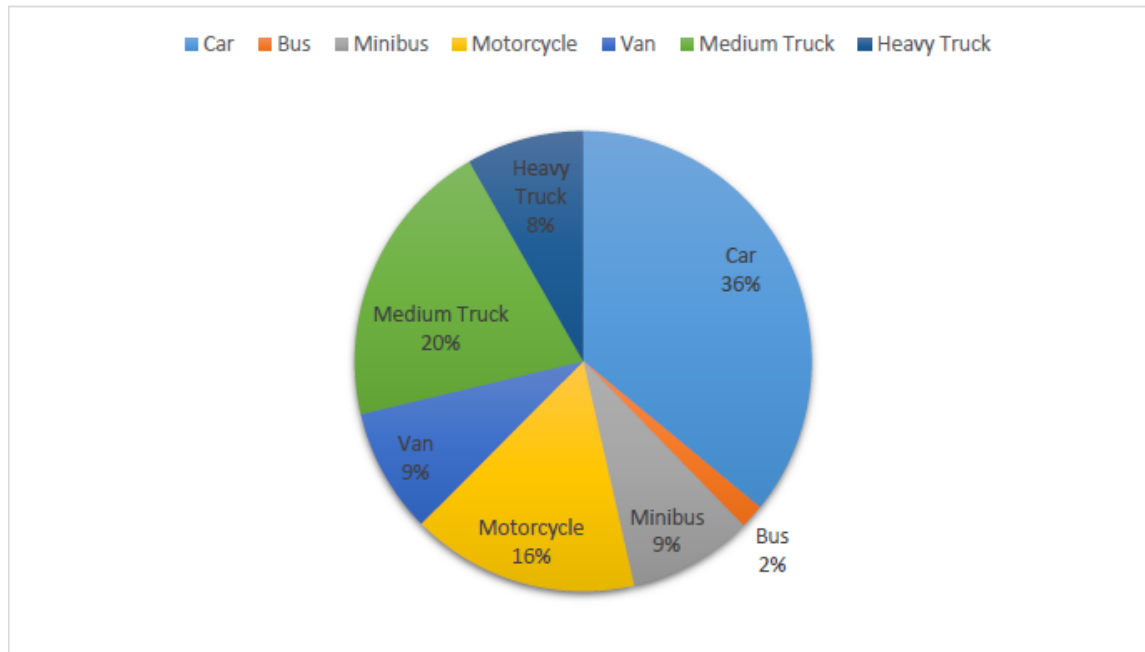
Transport Authority which sets national level regulatory functions. In Addis Ababa, following a recent re-organization, the municipality also placed all the powers expected of an urban transport authority under the Addis Ababa Road and Transport Bureau (AARTB). For the rest of the cities, and urban areas, the urban transport function mostly remained limited to the traffic control and management of private taxis and Bajaj's. Urban transport and urban roads are clearly defined as part of municipal functions.

7.3.2 State of motorization

Ethiopia's motorization rate is currently among the lowest in the world. However, the annual average growth rate of vehicle is about 10%, and motorcycles show record high growth rate of 25% per annum. Over the period 2011-2016, and in recent years, the country's fleet growing rapidly at a rate higher than 10% annually. In terms of distribution, it is much higher and concentrated in Addis Ababa than the rest of the country. For Addis Ababa, the state of motorization ratio, however, disproportionate with much higher rate than others. In 2016, there were 6 vehicles per 1,000 people in Ethiopia, which is extremely low, but 130 vehicles per 1,000 people in Addis Ababa showing the level of significant disparity.

The majority of registered vehicles, about 85%, are used cars mostly aged between 10 to 15 years old. In terms of use, in 2014 in Addis Ababa, private cars carry small percentage of trips which is in the range of less than 5 percent. Out of which car-based taxis, other than private use, contribute majority of vehicle traffic in the city. Following urban activity, and economic growth, rapid motorization will remain to be a challenge in addressing Urban transport problems and challenges city management programs. This is further aggravated by limited road capacity, and uncontrolled street-side parking practices creating congestion, and negative externalities contributing to the deterioration of air quality.

Figure 7.3 Share by type of vehicle



Up until 2022, there was no control, nor restriction on age or performance of imported vehicles, which is meant that unsafe and dirty vehicles can easily enter the Ethiopian automotive market. As a result, 85% of newly registered vehicles in Ethiopia are used cars, generally serving around 10-15 years old. Existing vehicle fleet is very old with majority of the vehicles aging over 14 years old. The management of in-use vehicles is poor due to vehicle emissions control and inspections inadequacy, and the old aging vehicle fleet lacks maintenance.

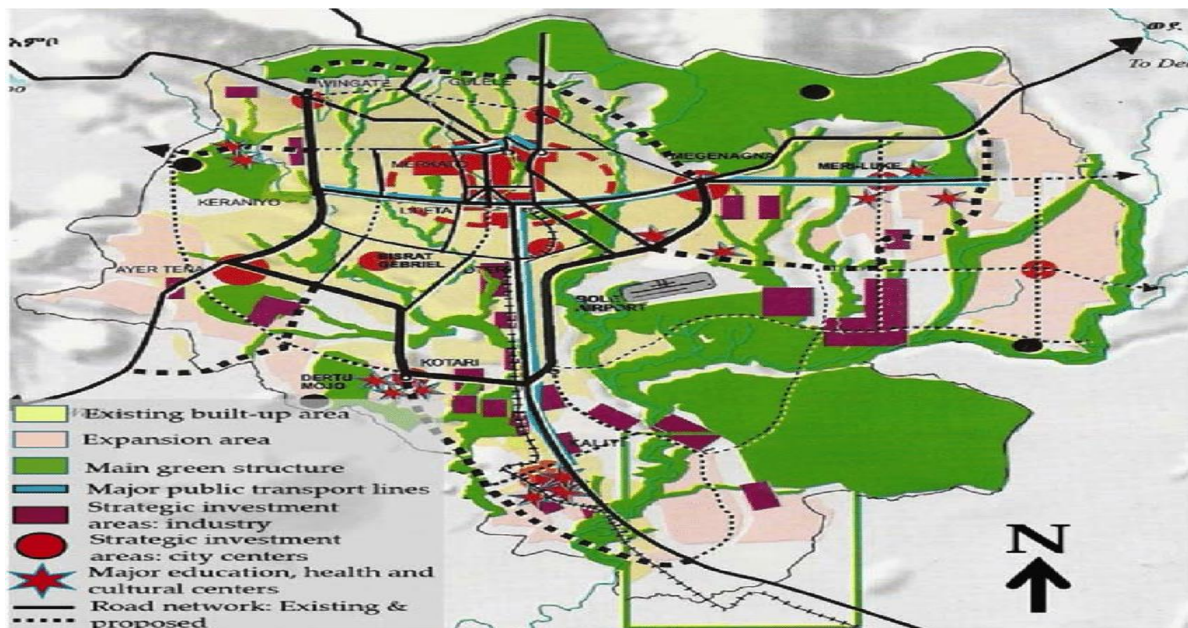
7.3.3 Land use and transport planning

The coordination between land use and transport planning is weak. Loose level of coordination between land use and transport planning activities is the weakest link and limiting factor negatively affecting improvement in future direction of transport in cities. Promoting sound land use and transport planning and management also means giving stronger priority to addressing the specific needs of the large portion of the population who mostly are economically vulnerable. The city experiences fast urban growth but even faster territorial expansion. This growth translates into a very fast expansion, which is

largely uncontrolled in terms of city planning and infrastructure. Rapid growth of urbanization engulfed by informal settlements, and service for derived demand, cannot be met by existing capacity of the transport system.

Addis Ababa's recent urban developments are not conducive to increasing the overall performance of the public transport system. In terms of land use development, northern Addis Ababa's mostly used for housing with limited services and commercial centers, the west is mostly occupied by real estates and well-developed roads. This area has many new coming businesses coming up since it is not overpopulated. The south is the most developing of all, and the area that contains almost all of the city's factories and heavy machinery shops. The east is fast developing and attractive with residential buildings, new houses and services. The International Airport is also located in the east which encourages shops, cafes, motels, travelling agents, and hotels to settle along Bole road corridor linking the CBD.

Map 7.1: Addis Ababa Structure Plan, 2002-2012,



Density increased at the city center, but decreased in the built-up areas, located 4 to 14 kilometers from the center. High densities are found near the core center where about 30% of the population located only on 8% of the land, with generally poor living

conditions. This is posing serious challenges in terms of service delivery, particularly regarding urban transport. Addis Ababa's housing density is decreasing as a result of the development of large condominium programs at the outskirts of the city. Grand condominium housing program, developed mostly at the outskirts of the city, there is low level of accessibility for residents who reside far from economic opportunities concentrated in the city center. The connectivity of these new residential areas, with economic activities at the city center, remains erratic. The resulting urban sprawl causes inefficiencies in terms of mass transport servicing and related costs for residents.

7.3.4 State of urban roads

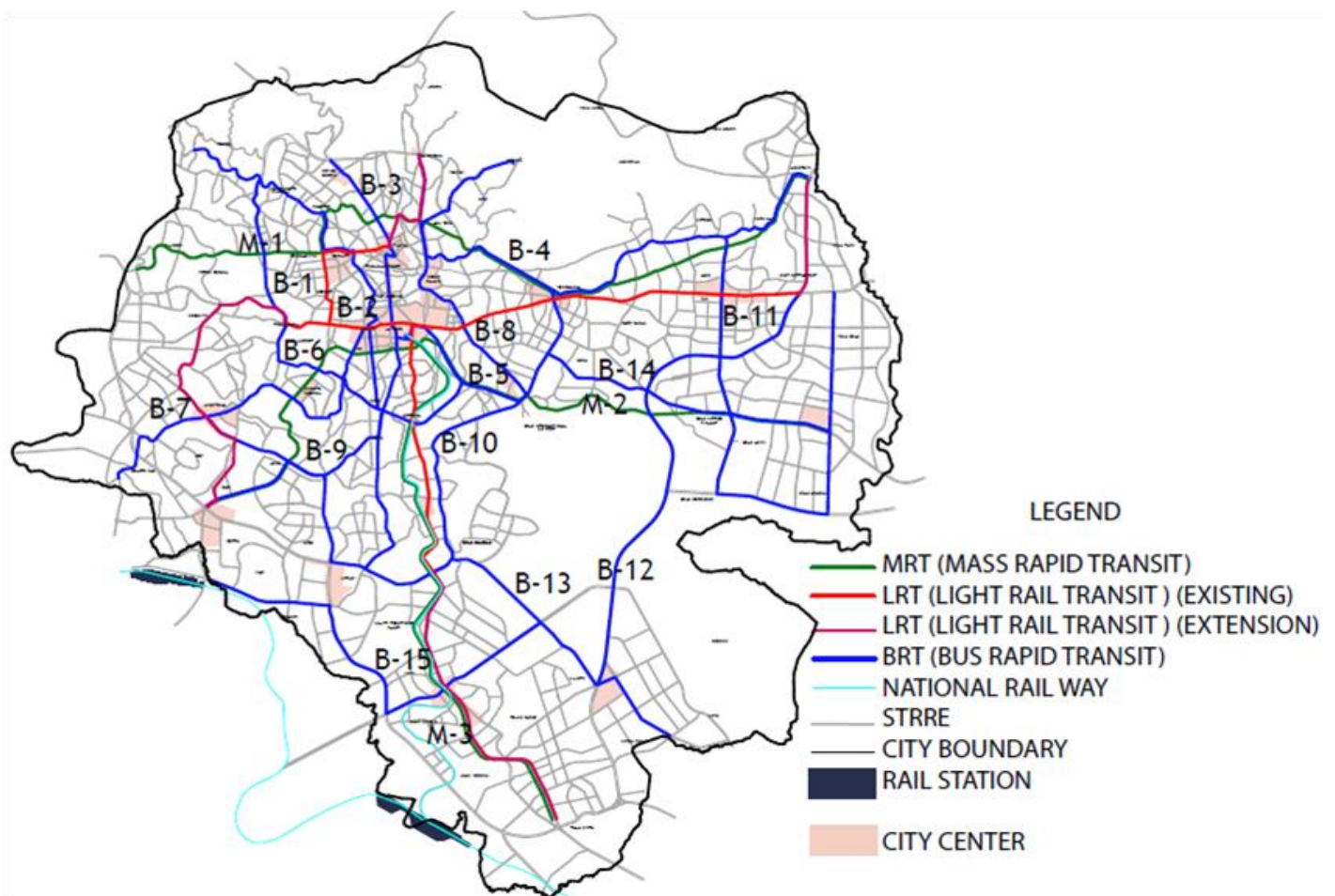
There are 2,900 kilometers paved roads, which only account 26 % of the total urban road network. High economic growth rates leading to high road-based motorization in the country. In practice, the city roads were designed "for cars, not for people". As a result, the city striving to move away from car-centric design to create new design standards for having a continuous pedestrian walkway with high-quality footpaths, safe at-grade crossings, and adequate street lighting. At the same time setting national design standards, building on the Addis strategy can help to ensure future safe and accessible infrastructure for secondary cities, as well. Addis Ababa attracted significant investment while secondary cities lack road infrastructure and provisions of adequate services. Over the last few years, only Addis has seen a significant growth center in the rate of motorized individual transport. With the current economic growth spreading across the country, there will be large increase of motorization rate in all parts of the country. Therefore, it is even more vital to enable secondary cities to get better access for the poorer inhabitants as well as creating options to reduce, or regulate, the growth of private car use. A dedicated sustainable urban mobility plan aligned with mode specific action can lay the foundation for a sustainable transport system for secondary cities.

7.3.5 Public transport in Addis Ababa

On a daily average bases, there are about 2.2 million people using public transport in Addis Ababa, which is equivalent to a total of 3.6 million trips per day. Public transport

in Addis Ababa currently consists mainly of Minibus-taxis, (around 12 000 vehicles), buses operated by a public company called Anbessa (around 400 buses), and the newly created municipal bus company Sheger (4 years old and having around 200 buses). Anbessa is a long-established (75 years old) state-owned public transport bus enterprise, which is uniquely operating as city bus public enterprise. There are also private midi-buses, called “Higer” (around 400 vehicles), and Taxis (about 6,000vehicles) and private buses operating as associates.

Map 7.2 : Addis Ababa Mass Transit Map



Addis Ababa is also one of the few cities in Sub-Saharan Africa to have developed, and implemented ambitious mass transport system, developing the first of its kind Light Rail Transport (LRT) system. Addis Ababa introduced Light Rail Transit (LRT) system of two lines operating in a distance totaling to 31.2 km, and the LRT operating on East-West

and South-North corridor routes of Addis Ababa. Currently the LRT transporting around 120,000 to 150,000 passengers daily. It would help in promoting sustainable urban mobility in the capital city through development of mass transport system. Up until recently, Addis Ababa Light Rail is actually the only light rail transportation system in Sub-Saharan Africa, and the city is working on a BRT network with six lines under different stages of development. Despite these developments, the shortage in the supply side of public transport remains a major issue and local authorities struggle to meet the growing demand.

Within Sub-Saharan Africa, the public transport system of Addis Ababa appears to have rather unique features in that a great majority of paratransit operators are regulated in terms of licenses, fares and routes, while other African cities struggle to regulate informal urban transport operators. This appears to be a clear strength of the system and demonstrates a rather strong enforcement capacity at local level. Moreover, it is in Addis Ababa that Anbessa, the oldest public bus company in the African continent, was born and has remained in operation for the last 70+ years. Even if the municipality-owned bus company faces a difficult financial situation, which affects operations (the number of available buses (per population) has been decreasing because of the advanced age of the fleet, maintenance challenges and insufficient funding), it benefits from strong experience and professional, albeit outdated, operational methods. The recent creation of a second municipal bus company, Sheger, benefitted from the experience, human

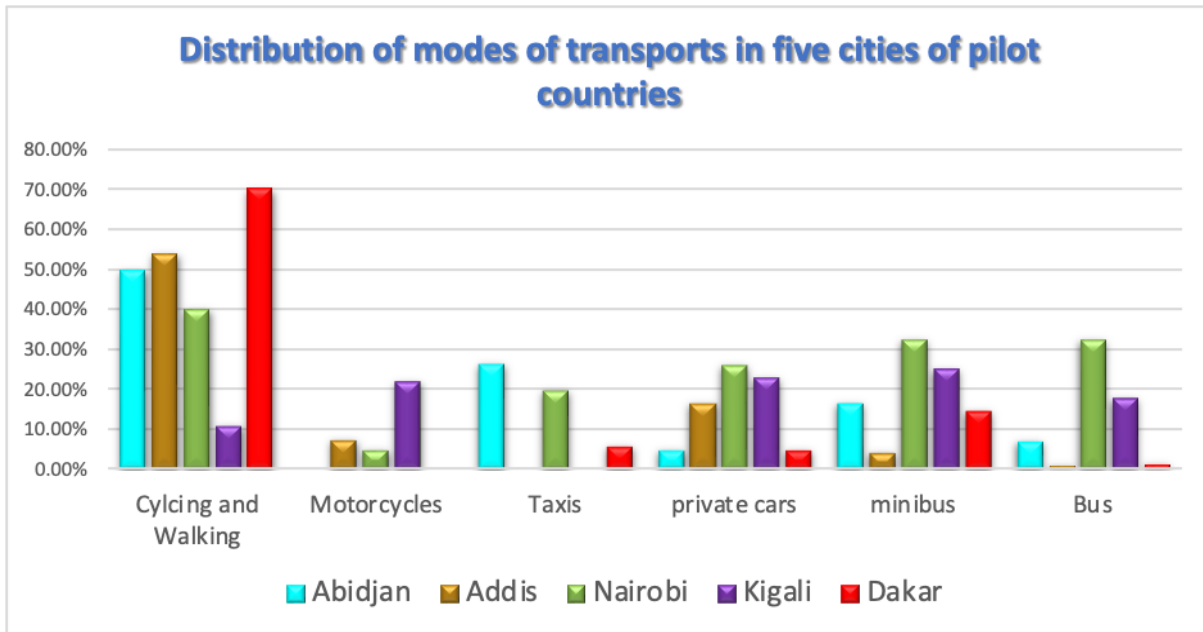


Figure 7.4: Modal Distribution Transport in Five Africa cities

In response to the growing demand for urban mobility, paratransit service vehicles play key role in urban transport provisions and fill the gap of complementing the mass transit system. While small vehicles generate nuisances, due to congestion and pollution, they also provide affordable service in places where none other is available. Main problem with paratransit is its lack of integration with other modes of transport, inefficiency, overaged vehicles and small vehicle capacity creating congestion. Hence, redeploying and improving already-existing capacities, rather than gradually driving them out, could be seen as complementary to the mass transport system.

With the culmination of urban sprawl, and growing traffic congestion, the average daily time spent traveling in the city keeps increasing. Despite mass transport projects such as the LRT, and soon the BRT, the growing demand for public transport remains vastly unmet. This notably translates into very long waiting lines at peak hours in front of the mini- and midi-bus taxi stages and stations. In Addis Ababa, many modes are competing in a haphazard way and multimodal transport planning is not yet well practiced. As such there is no well-structured interchange, or network hierarchy with a

planned integration, between mini and midi-buses, buses, the LRT and the future BRT, NMTs.

7.3.6 Non-Motorized Transport

Many citizens, particularly the poorest, use walking as their main means of meeting their mobility needs. However, while the majority of the people in Ethiopia's cities are walking, there was not much attention to the most vulnerable part of the population in terms of infrastructure and services for walking and cycling. There is lack of pedestrian and non-motorized facilities as a key impediment for walking and cycling in Addis Ababa. The lack of pedestrian and non-motorized facilities is a key issue in Addis Ababa. Large majority of citizens, particularly the poorest, use walking as their only option of meeting their mobility need, as their last resort choice mode of transport. The recently launched Non-Motorized Transport (NMT) Policy 2019 - 2028 for Addis is a significant step to refocus its planning and investment in the future. However, more than 65% of the road network lacks pedestrian walkways. Sidewalks are often obstructed and have very few pedestrian crossings. This situation, as a result, is a cause for 60% of all serious crashes and 73% of all road traffic crash-related fatalities affect pedestrians. Though over half of transport trips are performed by walking in Addis Ababa, secondary cities are more promising for Non-Motorized Transport (NMT) than Addis Ababa. Currently, the motorization rate in those cities are extremely low and the main transport modes are walking and three-wheelers (Bajaj).

In the absence of public transport systems, in most secondary cities and small towns, three-wheelers respond to the mobility needs of the population. There is rapid increase of three wheelers, as the primary mode of transportation, playing major role in provision of motorized mobility services in secondary cities. Though three-wheelers are demand responsive, they are often considered to be unsafe and highly polluting. There is a low degree of enforcement of the public transport modes in particular on the three-wheeler operations resulting in reduced road safety conditions and unregulated fares.

Main secondary cities services provided by growing number of "Bajaj" vehicles. They provide shared services, five passengers maximum, and services regulated and

controlled in terms of licensing, predefined routes and fares. They are considered to be to substantially contribute to air pollution, congestion and road accidents. Official fares levels appear to be low compared to actual investment and operations costs. Generally, pedestrian and cycling facilities should be developed and improved in secondary cities to enable the crucial development of Non-Motorized Transport (NMT) modes that appear well-adapted to the morphology of Ethiopian secondary cities and to the needs of their inhabitants.

7.3.7 Affordability of public transport

According to the urban transport study for Addis Ababa, conducted by SSATP, the study stated that :-

“In 2014 in Addis Ababa, 33% of the poorest residents (representing 21% of the capital city’s population) used walking as their primary transportation mode, while it was the case of only 4% of the richest residents (representing 1% of the capital city’s population) and of 19% of the people living in Addis Ababa on average. Counter-intuitively, the share of transportation expenses per capita increases with income, from 6% of expenses for the poorest quintile (and the same proportion for the poorest 28.1%, which corresponds to the population below the poverty line), to 11% for the richest quintile. This is probably a consequence of the fact that only the richer can afford to use a larger share of their consumption spending to cover mobility needs. “Affordability of public transport for the poor is low in Addis Ababa as compared to other developing cities: in 2014, 60 monthly public transport trips (one return trip/day) would represent more than half (53%) of the average monthly expenditure of the poorest quintile. Hence, the poorest people in Addis Ababa could make only 7 transport trips in a month with the budget that they allocated to transport.”

On the other hand, unaffordability of transport for the poorest citizens and insufficient transport supply for all citizens explain the high proportion of pedestrians in the city. However, interestingly, the 2014 Addis Ababa household mobility survey revealed that:-

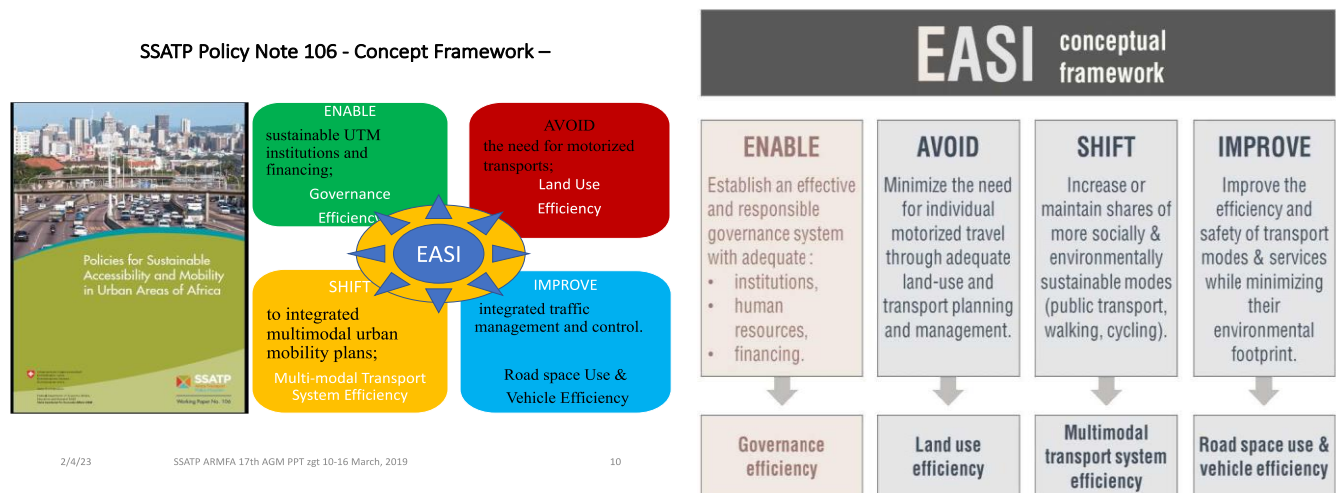
“the absence of available transport was the most important reason for people to walk, rather than the lack of money, even in places where the proportion of poor residents is the highest. Similarly, price appears to be a very minor reason for not choosing the bus in the overall population, and even more so for the poor, while factors such as punctuality, frequency and overloading are major reasons for citizens not choose the bus for their transport trips.”

Results of the studies clearly demonstrated that a key factor, as a barrier to increasing access to the urban poor, and for the overall population, to motorized mobility relate to insufficient supply of cheaper mode public transport than the price of transport fares. To effectively address the mobility needs of poor citizens, representing around a third of the urban population, and thus to contribute to the overall performance of the public transport system, the situation calls for adequate response justifying the need for ambitious public transport supply side strategy.

7.4 EASI Concept Framework

The EASI concept framework is an integrated urban transport and mobility management approach comprising a set of policy actions grouped into four sustainable transport strategic intervention areas; namely Enable, Avoid, Shift, and Improve. EASI describes a concept framework of comprehensively integrated higher-level approaches (strategies) needed for the development of sound policies and their implementation. The policy has four objectives (Enable/Avoid/Shift/Improve) with long-term goal of developing “secure universal access by sustainable transport for urban populations by 2030”. The results of this work presented in Working Paper No. 106 – “Policies for Sustainable Accessibility and Mobility in Urban Areas of Africa”, which describes the EASI concept framework, as a set of specific policy actions grouped into four areas.

Figure 7.5: EASI Concept Framework Key Components



The development of Enable/Avoid/Shift/Improve (EASI) concept framework presented an important first step towards advancing integrated urban transport management and development for cities. It presents a common language for communication between technical and administrative practitioners. It is based on the empirical evidence gathered from a pilot study of experience from a representative sample of cities in Africa. The goal of EASI concept is in line to SDG transport target of Sustainable Development Goal 11 - Make cities and human settlements inclusive, safe, resilient and sustainable. The EASI framework four building frames are:

ENABLE- National and urban decision makers and technical staff aim at adopting, and are capable of putting in place sustainable urban transport planning, monitoring, coordination, and financing mechanisms;

AVOID - Urban decision makers and technical staffs have knowledge of and start to apply urban forms that minimize the need for motorized transport and favor public and non-motorized transport;

SHIFT - Urban decision makers and technical staff have knowledge of and have competently completed preliminary steps towards adopting and implementing sound integrated multimodal urban mobility plans with particular emphasis on the promotion of non-motorized transport modes and the restructuring of informal public transport services;

IMPROVE - Urban decision makers and technical staff have knowledge of and have competently completed preliminary steps towards adopting and implementing key measures needed to improve traffic conditions in African cities;

The working paper propose specific policies and strategies to be adopted by cities in each of the four areas of intervention. Countries can then adopt the EASI concept framework to implement pertinent issues, as appropriate, or most important priority activities. Enable aspect comes as a pre-requisite for most cities in Africa in terms of institutionalization of urban transport and mobility management, as contained in the EASI framework. In Ethiopia, the Concept Note was first presented at a stakeholders Workshop held in December 2015 in Addis Ababa. It was an opportunity to disseminate the concept framework, and its applicability, for stakeholders to have an understanding and appreciation on the subject matter of urban transport and mobility management for cities. It was also to gather review comments, opinions and suggestions from stakeholders and representatives of SSATP member countries for program improvement of cities in Africa.

7.5 Summary and conclusion

The Urban Transport and Mobility system of Ethiopia is facing the common problems, and challenges, emanating from growth of urban population, accelerating urbanization, motorization and climate change. Many of these challenges require comprehensive and sustained responses at the policy level. However, cities may not have knowledge-based awareness, or capacity to plan, to regulate and have control on their urban transport systems. Urban transport and mobility condition of cities, in Ethiopia, is a growing concern for decision makers and all stakeholders in the system. Ethiopia's urban transport system faces many challenges that need to be addressed in good time in a comprehensive way for sustenance. On the other hand, public authorities do not have full control on the supply side shortcomings of public transport system in responding to the unprecedented, suppressed demand. It's a reflection of the inability of the public sector to effectively control urban development, and in developing integrated multimodal urban transport system.

The reality on the ground shows prevalence of informal settlements, especially on the outskirts of the cities, where land is available, but services are usually insufficient, or not available. On the contrary, formal jobs and key administrative or health services are often located in city centers, which results in long and difficult trips for many city residents. The difficulty of cities in developing sustainable urban transport systems is exacerbated by incomplete urban transport planning and land use management. Most local governments are neither equipped nor prepared to respond to the challenges associated with fast urban growth. For instance, non-motorized transport (NMT), particularly walking, as the dominant transport mode receives very little attention. Whereas walking makes more than 50% of daily trips in urban areas. Cities lack adequate sidewalks, or signalized and safe intersections, and access to public transport stations. The challenge of cities to manage and develop sustainable urban transport systems further aggravated by absence of multimodality for efficient accessibility and mobility.

Despite the number of positively enacted transport policies and strategies, and heavy investment, the results achieved so far are minimal. They are by far low in meeting the dire need of the people and have limited success stories in bringing desired result. For instance, in the absence of a well-organized, regular and efficient public transport, the paratransit services forced to flourish following the growing market demand. The paratransit sector is an important socio-political and economic force and a key stakeholder in filling the gap, and hence improving the overall state of the urban mobility situation. As a result, there are combination of large buses of different sizes, sedan taxis and motorcycle taxis that operate inefficiently under varying degrees of regulation and law enforcement.

In addition, shortage of resources has greatly hampered the improvement and development of urban transport infrastructure and services in cities. Human resources are often lacking, both in quantity and quality, particularly in terms of the technical skills required to deal with complexity of urbanization. Assessing potentials and alternative solutions for urban transport improvement requires mobilizing considerable resources for urban transport development. This would help in tackling the challenges, and to properly advise policy decision-makers to help them formulate and implement feasible strategies.

CHAPTER EIGHT

8 Trade Logistics and Transport

8.1 Background

Effectiveness and efficiency of the supply chain management of a country depend on trade logistics and transport competitiveness, as well as the relative influence on value of goods and services. It is known that the high cost of transport and low-quality logistics undermined the growth potential of the country's ambition of export-led, import-substitution strategy of the Economy. To that effect, the country heavily invested along the corridors for the development of major infrastructure projects on Road and Railway programs. Assessment of supply chain management requires holistic look into the management of freight movement starting from production, packaging, materials handling, transportation, warehousing and security. Ethiopia is a country in the horn of Africa, connected by road and rail-based transport modes to the coastal port of Djibouti. Djibouti port, and the corridor, are the main gateways for Ethiopia by lifting the lion's share of import and export cargo transported.

Ethiopian trade and logistics system undergone through transformation process from public sector dominated freight transport to a more liberalized private sector. The transformation has brought marked results to the flow of import and export goods, and it's important to analyze level of strategic response to the growing demand. From the angle of transport provisions of the corridor, it's important to analyze the trade logistics operational efficiency and effectiveness. As a critical factor for competitiveness, and Ethiopia as a landlocked country, aspires to maintain high performance on the logistical operation of its corridors. However, the performance of the Ethiopian logistics system is not well coordinated in the process of its supply chain management. In this regard, it's important to look into the way freight is handled in ports, railways, roads, aviation and dry ports. For instance, freight transport cost escalate as a result of time-consuming

documentation, complexity of procedures, high vehicle operating cost and loss of travel time due to bad road condition. In addition, non-physical barriers on transport have a direct bearing on competitiveness of products by increasing the overall cost of transportation

8.2 National Logistics Strategy

The National Logistics Strategy is meant to guide the way forward of regulatory bodies, operators, importers and exporters, customs clearing agents, freight forwarders, non-government organizations, and other logistics service providers. The National logistics strategy aims at the creation of an enabling national strategy that would help in resolving logistic challenges and hindrances. It is to help reduce logistic costs, incurred due to inefficiency and waste of time; provide systemic logistic solutions, and coordinating the different players. It is also to provide effectively coordinated direction, and leadership, to different stakeholder groups working in the supply chain management system. It is not only about goods transported, and aspects of multimodality and warehousing, but also ways on how to reduce the costs of doing business.

8.3 Multimodal Transport System

Multimodal transport, also known as combined transport, is the transportation of goods under a single contract, but performed with at least two different modes of transport. The carrier in legal sense have the liability for the entire carriage, including services performed by several carriers using various modes of transport by rail, sea and road. The carrier does not have to possess all the means of transport, but rather the carriage is performed by sub-carriers. When the carrier is responsible for the entire carriage it is referred as a Multimodal Transport Operator. Overall, the assessment is made on the trade and logistics performance of road, railway, maritime and air transport modes, and focusing on logistics aspects of the Djibouti corridor.

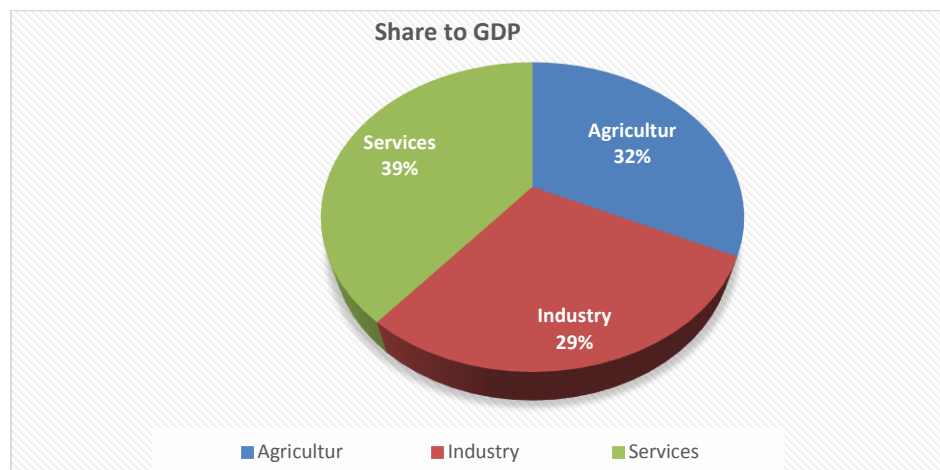
Ethiopia has been implementing a Multimodal Transport System (MTS), since January, 2012, and the Ethiopian Shipping and Logistics Service Enterprise (ESLSE) is in charge of

managing the supply chain process, coordination and the operation of import and export freight transport. The enterprise is established to reduce coastal and international marine and inland water transport service costs. The objective bases are to reduce freight forwarding, enhance multimodality, and to provide shipping services, and hence ESLSE mandated to ensure efficient, cost effective and reliable import and export movement of cargo to and from the seaports of coastal countries. It's also responsible for the development of technological capacity in order to render maritime and transit transport services and to engage in related activities to achieve its objectives.

8.4 Import Export Trade Volume

With a total population of about 120 million people (2020), and one of the fastest growing economies, Ethiopia has large domestic market driving the import and export trade of the country. With average annual economic growth rate of 9.5 %, per year, the agriculture sector is the engine of the Ethiopian economy. According to the National Bank of Ethiopia (NBE), during the 2020/21 Ethiopian fiscal year, agriculture, industry and services respectively contributed 32.5%, 29.3% and 39.6% to the GDP. Over the past ten years however, the industry and manufacturing sectors showing gradual growth in their share of GDP. The construction industry, particularly roads, railways, dams, industrial parks and housing development, are the main drivers of growth to the industrial sector, by contributing more than half of the sector's growth.

Figure 8.1: GDP share of Agriculture, Service and Industry

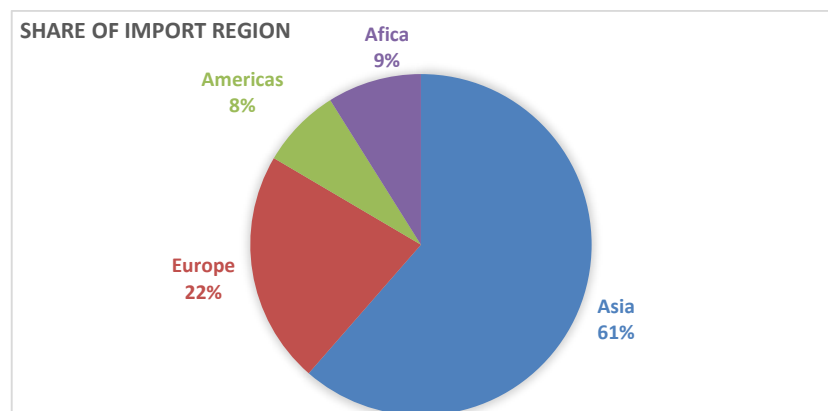


8.5 Import Export Trade Balance

Over a period of eight years, the Ethiopian import trade volume doubled from 6.3 million tone, in 2012/13, to 12.4 million tones, in 2020/21. For the period between 2006 to 2021, the fifteen years annual average of export goods is 9.24 million tones. Over the same period, the import volume more or less remained steadily constant. Over the fifteen years period, the average annual increment by volume of export items is 4.67 percent, and the average increment for import items is 24.27 percent per year. Import volume increased fivefold over export; which is having direct implication to the level of return load factor for operating trucks. With fast growing imports, and less on exports, efficient performance of transport will thus be challenged in terms of the desired potential to reduce transport costs and journey time.

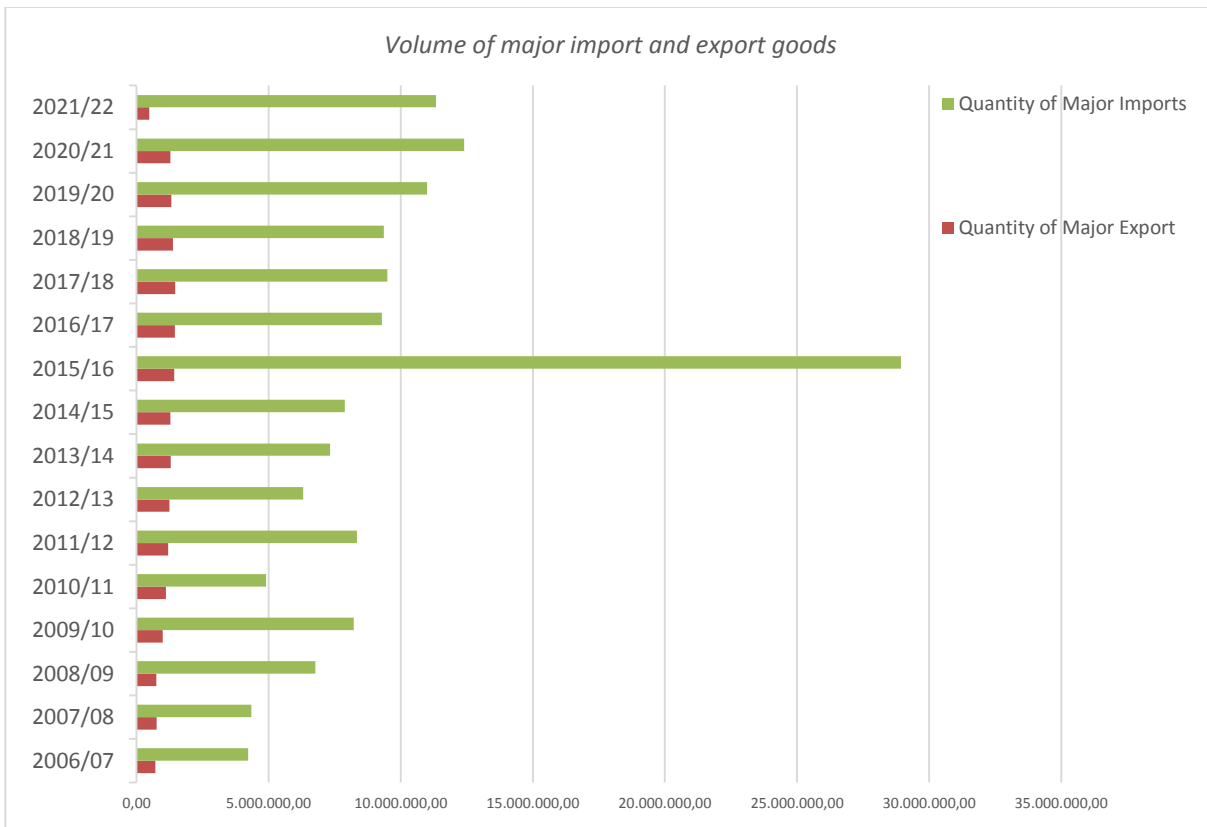
Despite notable growth records, over the last 10 years, the country faced a growing trade deficit as total imports increasing on average by about 12.5% per year. The rise in the trade deficit has been driven by rising imports; which increased from \$4.8 billion in 2010 to \$14.4 billion in 2015. In value terms, 27.2% of total import spending (\$3.9 billion) was on capital goods and 38.3% (\$5.4billion) on consumer goods. According to the NBE annual report, the vast majority of Ethiopia's import generate from Asia (61.3%) followed by Europe (22%), the Americas (7.6%), and other countries in Africa (8.9%). In terms of value, imports from China accounted for 22.8% of Ethiopia's total foreign supplies.

Figure 8.2: Share of Import by Region



The import export trade showed significant level of trade imbalance, which is causing imbalance to cargo transported to and from the country. According to the National Bank of Ethiopia (NBE) annual report, in 2020/21, the total value of export trade items have a value of 128.87 billion Birr and the import items value of 559.34 billion birr for the same period. In value terms the ratio of import to export is disproportionate with 1 to 4.38 units of account. In terms of export volume, in 2020/21, it's recorded to be 1,283,323 tones and import volume of 12,395,228.90 tones; which is in the ration of 1 to 10 volume of export to import proportion. The import and export total volume adds to 13,678,551.9 tons of outbound and inbound combined cargo volume ready for lifting.

Figure 8.3: Volume of major import and export goods



In terms of the size of cargo volume the ratio of export to import show disproportionate share with 1 to 9.66 units of account. For export items Coffee, Pulses, Fruits & Vegetables and Oilseeds take more than 75% of export volume. The rest of items taking less than 25%

of the export volume, and each with less than 5 percent volume share. For import items, more than 90% volume goes are general cargo items; with food and live animals (34%), petroleum products (30%), grain (16%), followed by metal products (11%). The remaining 9% are various import items taking small share of the cargo volume taking less than one percent of import items. In value terms, however, it's to be noted that they may have significantly higher value for the itemized products.

Figure 8.4: Volume of Major Export Items

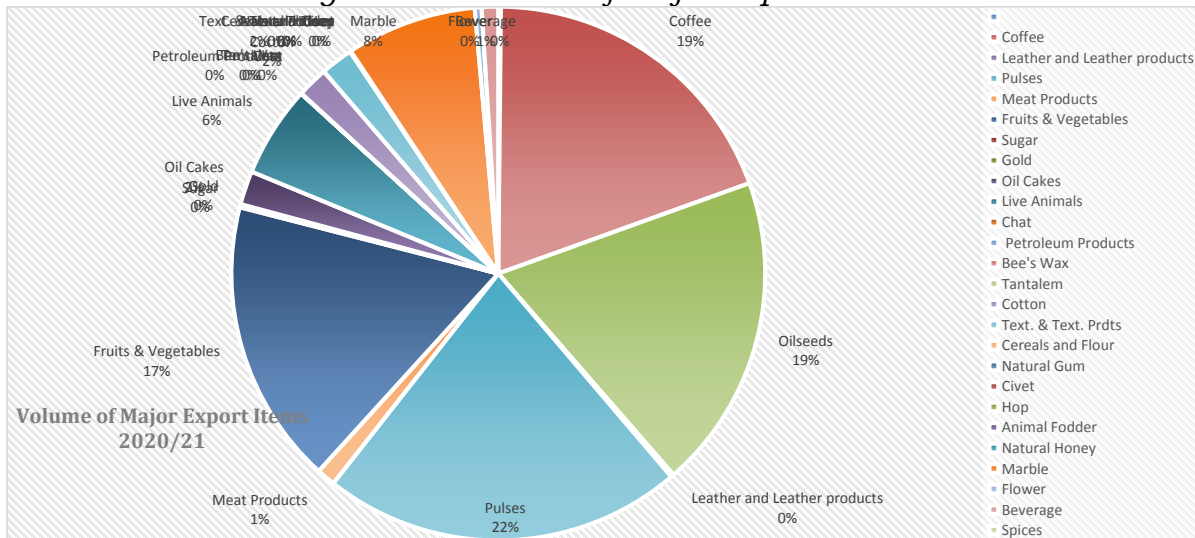


Figure 8.5: Volume of Major Export Items

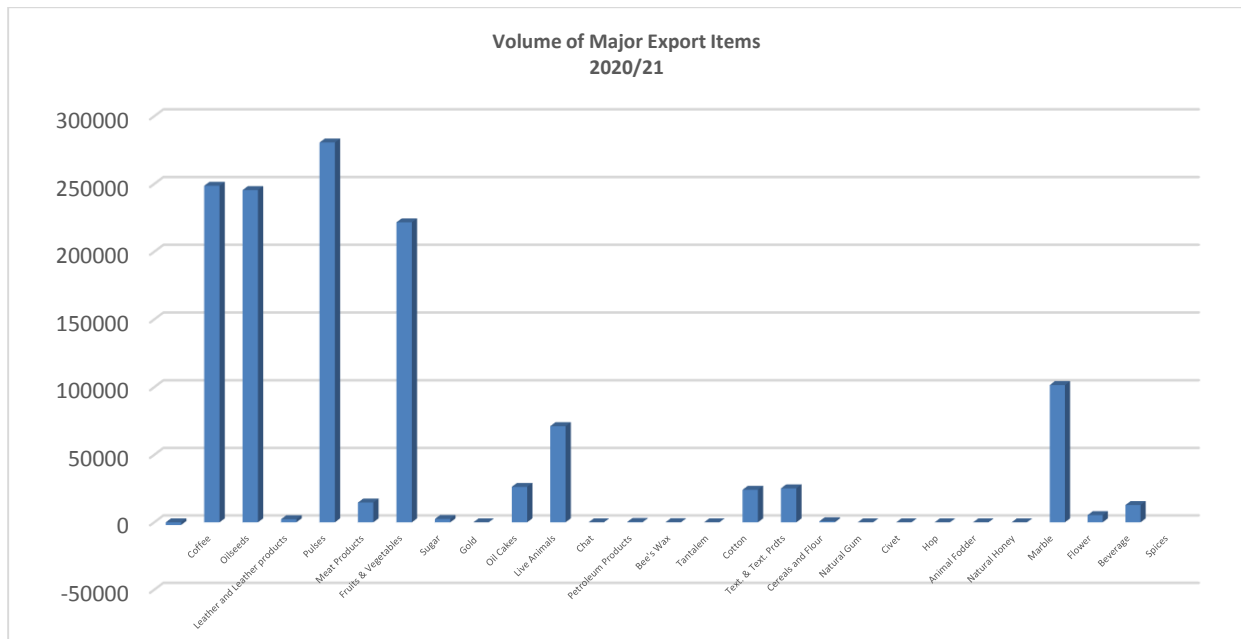


Figure 8.6: Volume of Major Import Items

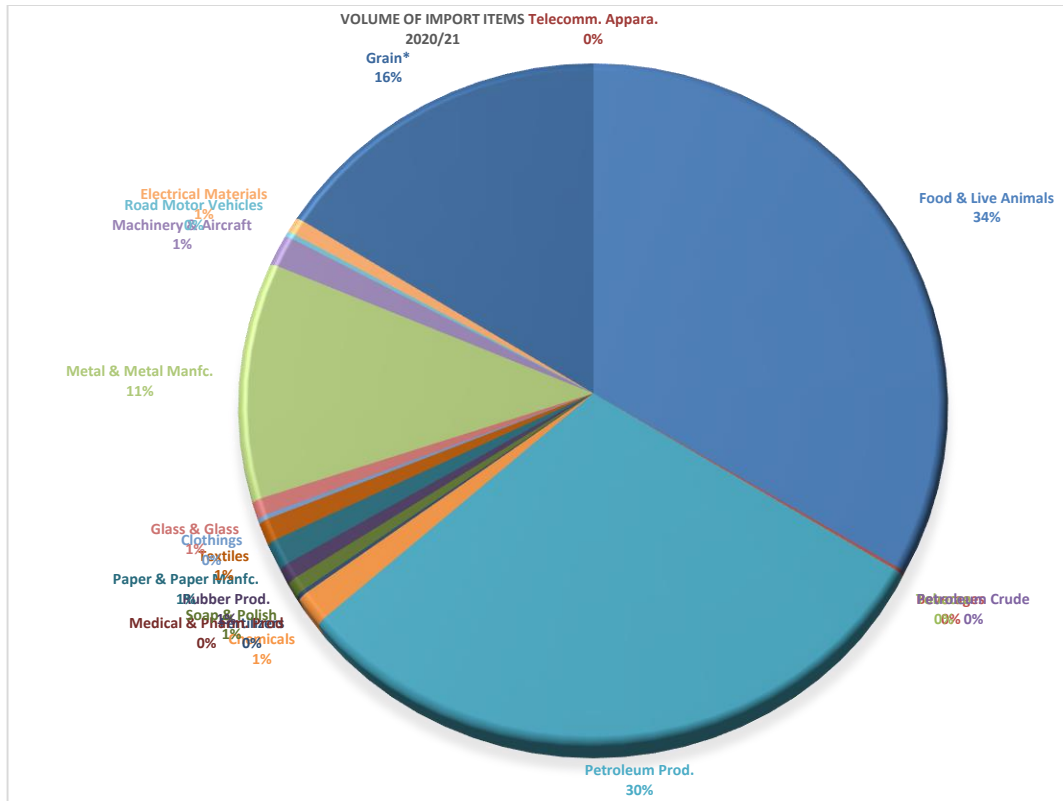
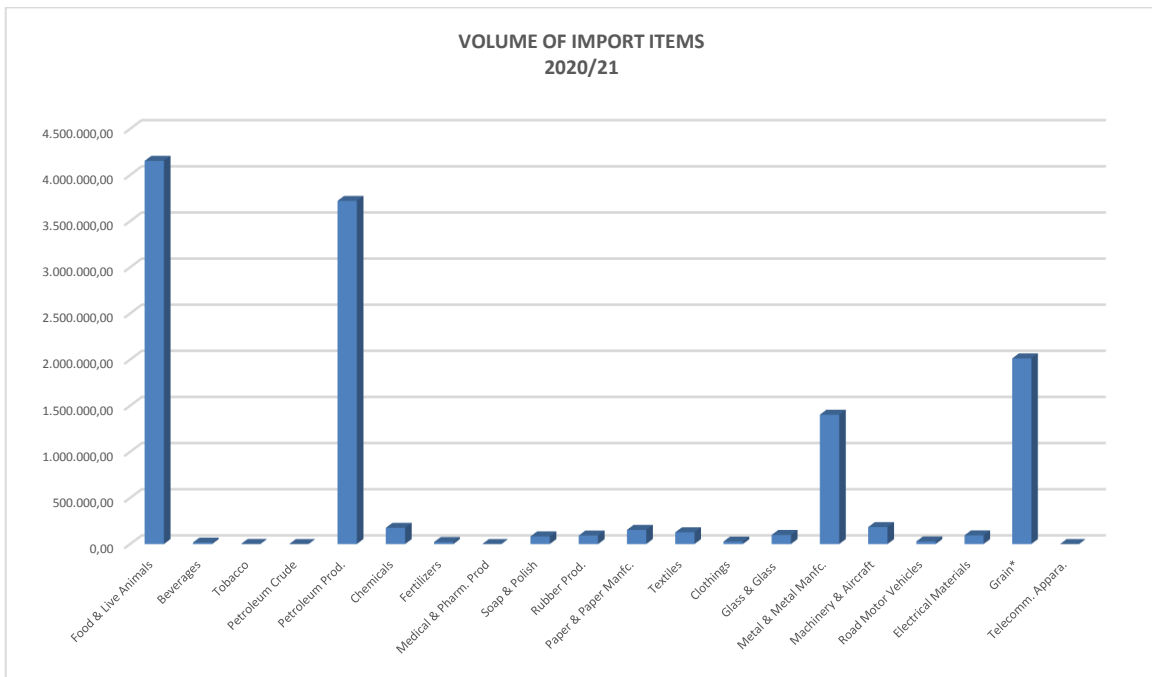


Figure 8.7: Volume of Major Import Items



8.6 **Ethio-Djibouti Corridor**

Ethiopia's main gate way to the international market is through the port of Djibouti which is connected by road and rail. Ethio-Djibouti corridor turn out to be the main trade corridor, linking Ethiopia to the Port of Djibouti, since the independence of Eritrea, in 1993. For landlocked Ethiopia, access to the sea is not only of paramount economic importance, but rather a matter of survival. Djibouti port, as the main coastal port, handles significant share of import export trade goods transported to and from the country. Over 90 percent of the country's import-export trade volume using the Addis-Djibouti corridor, and hence Ethiopian import export trade mainly relies on Djibouti corridor. However, the infrastructure and logistics facilities constrained due to substandard road infrastructure, in deteriorating conditions, and the standard-gauge railway line facing issues related with power outage constraints, and inability to attract fair portion of the modal share.

Ethio-Djibouti corridor zone of influence covering large areas passing through economically active areas in the eastern part of the country. Regionally, it has a critical place in regional integration, national trade, and socio-economic development programs by connecting consumption centers to production zones. It helps to strengthen the connection between the peoples of Ethiopia, Djibouti, and Somalia through enhanced opportunities for trade. Keeping corridor trade agreements, and collaboration with its neighbors, Ethiopia is looking for strategically competitive alternative corridors to reduce its dependence on a single corridor, and trade cost for competitiveness in the market.

8.6.1 *Transport cost*

Underdeveloped transport infrastructure and logistics system hamper trade competitiveness due to high cost of road transport and logistics services. Trade logistics cost, for Ethiopia, is a determining factor and critical constraining element for having efficient trade competitiveness. High transport cost for import export trade flow is a

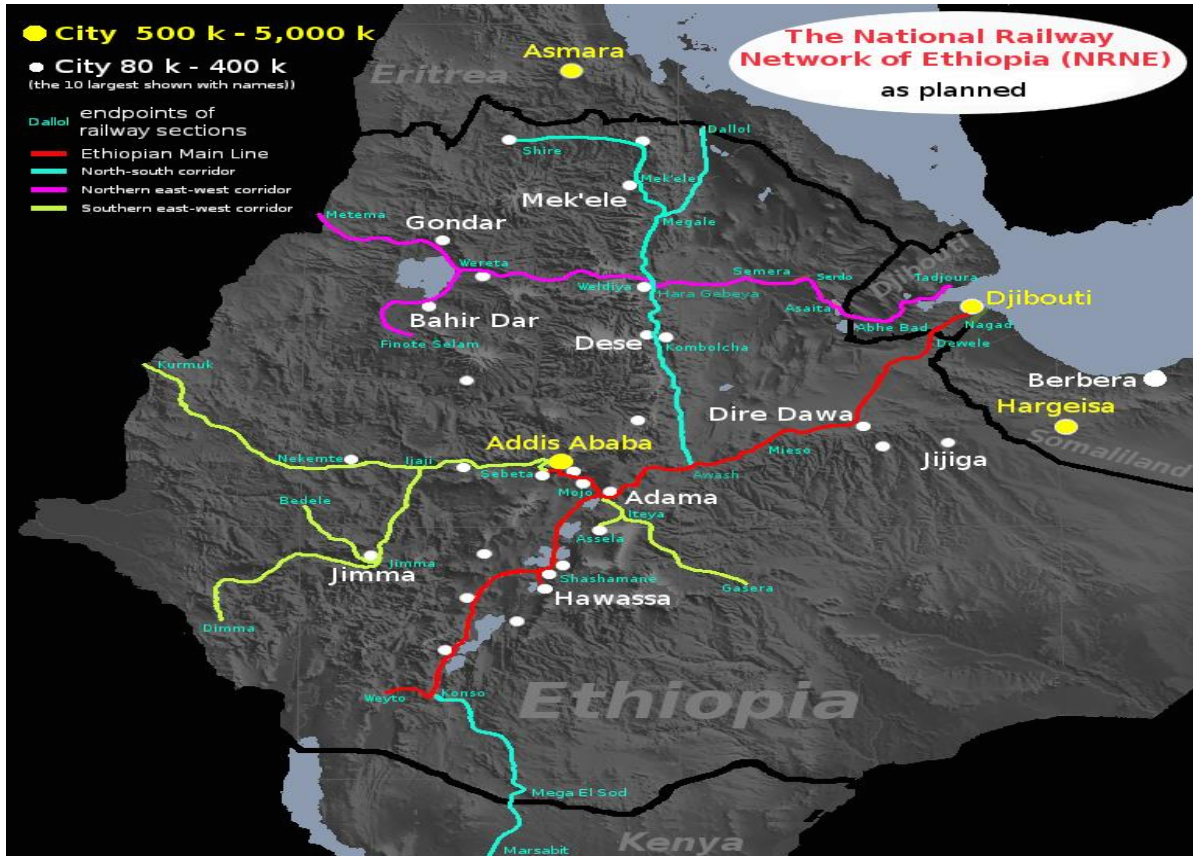
bottleneck hampering the country's aspiration for fast economic growth and development. In addition, the high logistics costs at national level undermine productivity of the economy in a significant way. Recent estimates place that the logistics costs, as a percentage to value, in Ethiopia, stand at about 30 percent; which implies that for every dollar of productivity, there is a logistic cost amount of 30 cents. Ethiopia's logistics sector lags behind competitor countries in Asia, and other land-locked countries in Africa. According to Nathan Associates study findings (2014):

“in terms of transport and logistics costs, a 20-foot container of garment exports to Germany, Ethiopia's logistics costs are 247 percent higher than those of Vietnam, and 72 percent higher than those of Bangladesh. Trade logistics have become increasingly important in Ethiopia because they are essential to the growth of the light manufacturing industry. The current supply-chain structure contributes to high overhead costs from managing input-material sourcing, in-house production, and finished product shipping. Overhead costs in Ethiopia can be twice than that in Asia. The fact that the entire supply chain is not geared to respond to time constraints makes this industry particularly difficult for Ethiopian companies to succeed (Nathan Associates 2014-2: 38–39).”

8.6.2 Ethio-Djibouti Railway

The Ethiopia Railways Corporation (ERC) planned a railway development program extending over 5,000 km rail line in the country. The first railway line built on the line linking Addis Ababa to the Port of Djibouti. It's stretching over 752 km; out which 82 km are in Djibouti. The line is dual track between Addis Ababa and Adama and is electrified. With operational speed of 120 km/hour, it was expected to reduce transit time to about 6 hours, compared to 3 days by road. The investment in the Addis-Djibouti railway infrastructure amounted to US\$3.4 billion. The ERC currently owns a fleet of 32 locomotives, close to 1,100 wagons and about 990 wagons designed for different kinds of cargos; while 110 only to transport fuel.

Map 8.1: National Railway Network Development of Ethiopia (as planned)



The new railway line have the ability to move large volumes of cargo in and out of the port. Currently, however, the rail share is less than 10 percent with only about 1.6 million tons out of a total volume of 19 million tons of cargo for lifting. Ethio-Djibouti railway, in one movement, has the lifting capacity of up to 180 twenty-foot equivalent units [TEUs], or 3,500 tons of goods per train. This can reduce the transit time to a quarter compared to road transport, which can reduce demurrage, and minimize steps needed to clear transit goods. Ethiopian railway is underutilized though it's having the high potential capacity of providing service to import and export trade along the Ethio-Djibouti corridor. Attracting more traffic to rail will reduce transport costs, reduce the financial burden of the railway, and as well contribute to decarbonizing transport in Ethiopia.

Though railways infrastructure investment important, it is not singularly enough to reduce the overall logistics costs only by infrastructure investments. Significant part of the cost and time savings come from changes to the logistics system that can reduce transit time in all modes of transport. Rail corridors have been constructed, linking local and regional markets and through regional ports connecting Ethiopia to global markets. Even if the rail link capacity to double, there will still remain the need for more than 15 million tons to be moved by road. This needs to be complimented by non-tariff barrier measures, in such as OSBB, for seamless and efficient use of the railway line.

8.6.3 Djibouti Port

The port of Djibouti handled large majority of the maritime traffic of Ethiopia, and more than 95 percent of Ethiopia's trade by volume moved through the Addis-Djibouti Corridor. Djibouti port has three main parts: the old port located in the city and the Doraleh Container Terminal opened in 2008 and the first phase of the Doraleh Multipurpose Port opened in 2013; which are both located to the west of the city. Approximately 85 percent of the total throughput in the port of Djibouti comprises cargo destined for or coming from Ethiopia. For Ethiopian trade, the Doraleh Container Terminal handle most of the containerized traffic; the general cargo area handling mostly breakbulk but also some containerized traffic; and the bulk terminal for bulk imports mostly of fertilizer, grains, and coal. Many of the problems currently faced are with respect to breakbulk and bulk imports. The delays in the port contribute to Ethiopia's high logistics costs for bulk imports.



Figure 8.2: Map of Port Infrastructure of Djibouti

For Djibouti port, the amount of traffic originating from, or destined to Ethiopia, accounts more than 80 percent of all the port traffic. Djibouti corridor alone handles more than 95 percent of Ethiopia's trade, which on average meant handling more than 850,000 tons of freight per month. Overall, cargo moved through Djibouti corridor accounts for more than 90% of import and export items. The key linkage being to Addis Ababa, and its surrounding areas, where about 90 percent of inbound containers are processed at the dry port of Modjo. As a result, for the foreseeable future, the dominance, and immediate focus for logistics improvements, will remain on Djibouti corridor. This is due to the fact that small volumes of Ethiopian traffic are using the other ports in the region; mainly Port Sudan and Berbera. Port Sudan, Mombasa and Berbera corridors altogether taking less than 10 percent of freight movement which are serving as alternative corridors.

Djibouti port focuses on the transit traffic for Ethiopia and provides transshipment activities for containers destined for other Eastern and Southern Africa (ESA) ports; acting as a regional hub to the northern end of the continent. In the Addis-Djibouti Corridor, road is the artery of transport for imports and exports, reaching a lifting capacity of 16.5 million tons a year. Freight are largely trucked from Djibouti to Addis Ababa and then distributed across the country. The Addis-Djibouti Railway carries a smaller volume of freight in order

of about 1.6 million tons a year and is operated and maintained by a joint venture of the Ethiopia-Djibouti Railway (EDR); with ownership split between Ethiopia (75% share) and Djibouti (25% share).

8.7 Regulatory Framework and Key Stakeholders

Ethiopia's trade logistics is influenced by a number of bilateral agreements and national policies, regulations, and administrative hurdles that considerably undermine supply chain system efficiency and competitiveness. For instance, the operating firms experience numerous challenges at various stages of the import/export process due to complicated documentation and approval processes. These included foreign exchange permit for all imports, and methods of payment for most transactions; letters of credit and cash against document have direct impacts to system. Logistics services in Ethiopia are dominantly provided by ESLSE; which is a government-owned enterprise. ESLSE provides shipping services, arranges the transfer of goods between Djibouti and Ethiopia, and operates the dry port at Modjo. Current government policy means that ESLSE is the only provider of multimodal services. Truck operations are provided largely by the private sector, and ESLSE contracts trucking services between the port and Modjo. Currently, it's estimated to have close to 10,000 trucks operating on the corridor to Djibouti. Ownership of the trucking fleet is registered under privately owned operators of individual independent truckers, road transport companies, and associations having individual truck owners.

Given the high traffic demand (19 million ton), both road and rail will continue to co-exist on the Addis-Djibouti corridor; with high potential for modal shift going from road to rail. Trucks operating are old aged, and according to EMMA report, in regard to truck age, about 44 percent of the operating fleet on the road served less than or equal to 10 years old, while 24 percent are 10 to 20 years old, and the remaining 32 percent are more than 20 years old. More than 50 percent of the fleet are above 10 years of age, and hence have frequent breakdowns and costly repairs with high downtime. Non-replacement of trucks leading to incurring huge maintenance cost, high operating cost, and low utilization of equipment. On the other hand, it's to be noted that the road transport sector, packaging,

warehousing, freight forwarding, and other logistics are areas of investment exclusively reserved for nationals. Due to shortage of modern trucks, the system appears to be encouraging new industries and investors to invest in their own in-house trucking capability, even though trucking is not their core business.

8.8 The Unimodal and Multimodal Systems

The two forms of systems applied along the Ethio-Djibouti corridor are unimodal transport and multimodal transport (MMT). Multimodal refers to the shipment carried under an MMT bill of lading issued by an accredited Multimodal Transport Operator, often the shipping line; which assumes the liability for the shipment. In contrast, 'unimodal' refers to the shipment carried under separate contracts of carriage performed by different carriers on different segments of the transport journey. In practice, the multimodal system is used solely for the import of containerized cargo and cars and requires shipments to be cleared at the dry ports in Ethiopia.

To a large extent, the use of the multimodal system has contributed to faster removal of goods from the Port of Djibouti, alleviating congestion in the container terminal. Before the introduction of the MMT bill of lading the average dwell time of a container at Djibouti was more than 45 days. The MMT bill of lading makes it possible to pass through Djibouti under customs seal and transit without the need for customs clearance. The unimodal system is used for other imports, mainly bulk and breakbulk, and the export of all types of cargo. Imported goods are cleared by customs in Djibouti. Most importers of containers use the multimodal system because this offers the advantages of lower storage charges and deferment of payment of duties.

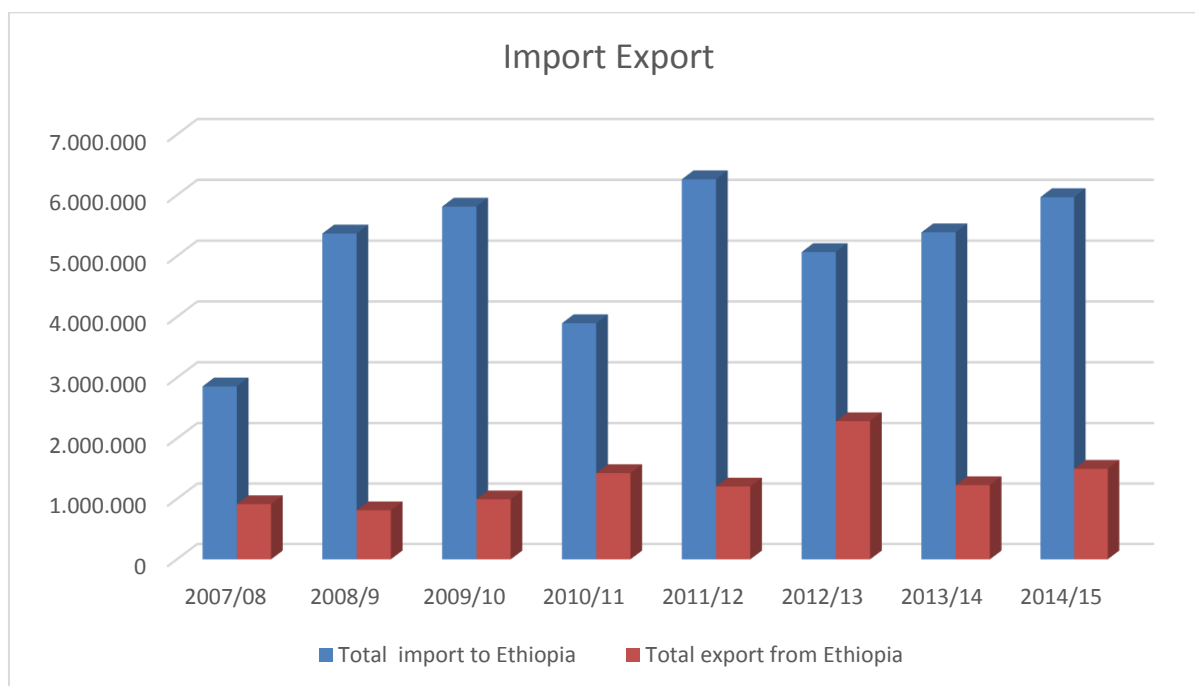
8.9 Import Export Cargo

Total import of cargo volume transported by ESLSE showed considerable increase. Over the periods between 2007 to 2015, however, ESLCE share from the total imported cargo has decreased to 56 percent due to the time it takes to discharge cargoes at the Port of Djibouti, and the use of chartered ships to uplift the increasing volume of cargo. The cargo

shipped by the enterprise from the year 2008 to 2015 showed a significant increase; which is in line with the growth period of the country's foreign trade. Accordingly, the volume of export cargo has increased to 1,498,206 tons, in 2015, from 913,690 tons in 2008. The volume of export cargo transported by ESLSE has increased to 10,706 tons, in 2015, from 3,527 tons in 2008.

Figures 8.11, 8.12 and 8.13 below show the Ethiopia export flows, Ethiopia import flows, and the combined export and import flows, and the dominance of the Addis-Djibouti corridor.

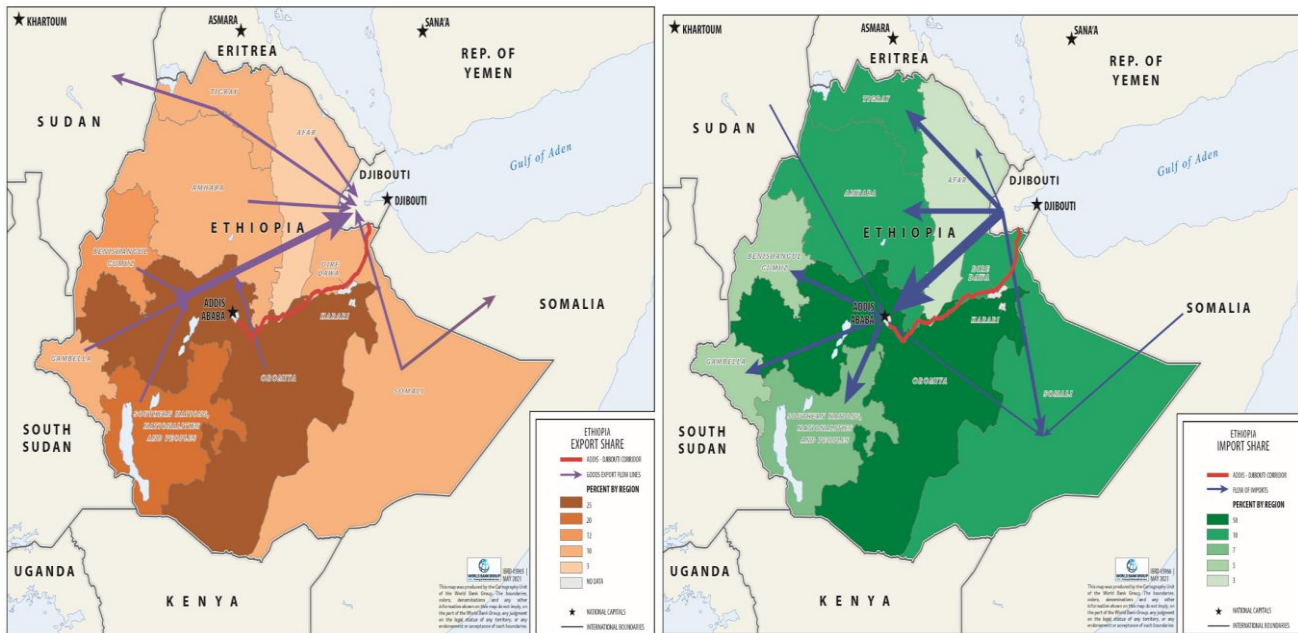
Figure 8.8: Imported Cargo by Sea Transport (including Bulk Cargo)-Tons



From the year 2008 the enterprise tripled its lifting capacity and reached a peak in 2015 of total lifting capacity of 4.4 million tons per year. About 61 percent of the total imported cargoes shipped by ESLSE during the last eight years is containerized cargo, 25 percent break-bulk, and 11 percent steel while vehicles accounts only 3 percent which shows that containerized cargo have large share of the imported cargoes followed by break bulk, steel and vehicles. With respect to dry port services, ESLSE manages seven dry ports located in different parts of the country.

Map 8.3: Ethiopia Export Flows Map

Map 8.4 : Ethiopia Import Flows Map



8.10 Dry Ports

Key nodes of the logistics chain in Ethiopia are the dry ports located at Modjo, Kombolcha, Semera, Kality, Dire Dawa, Kombolcha, Woreta and Gelan developed in conjunction with the multimodal system. The Modjo Dry Port, 65km away from Addis Ababa, is the largest taking the majority share of Ethiopia’s inbound containers. It has been operational for more than five years, and Modjo serves only multimodal inbound container handling facility for import or export traffic. Unimodal imports are processed and released from Comet Dry Port, or at the customers’ premises.

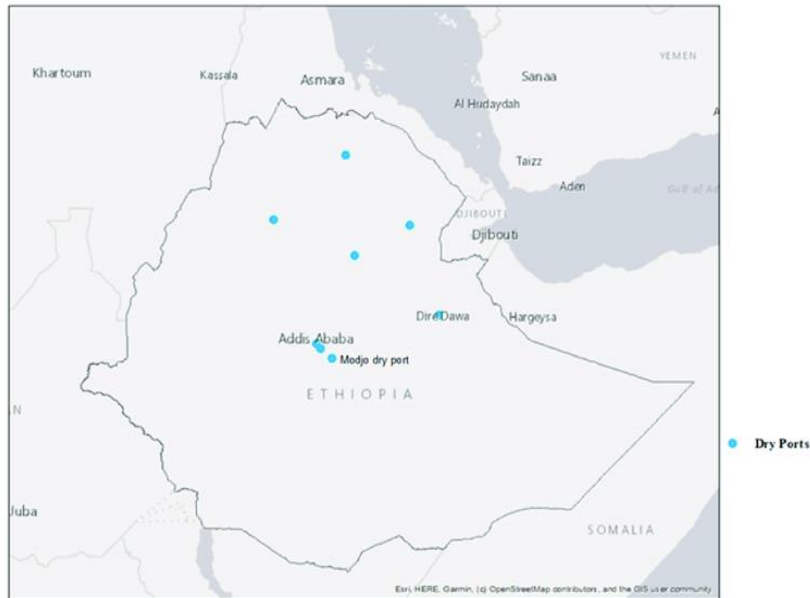


Figure 2. Location of the eight dry ports in Ethiopia.

Map 8.5 – Location Map of Dry ports

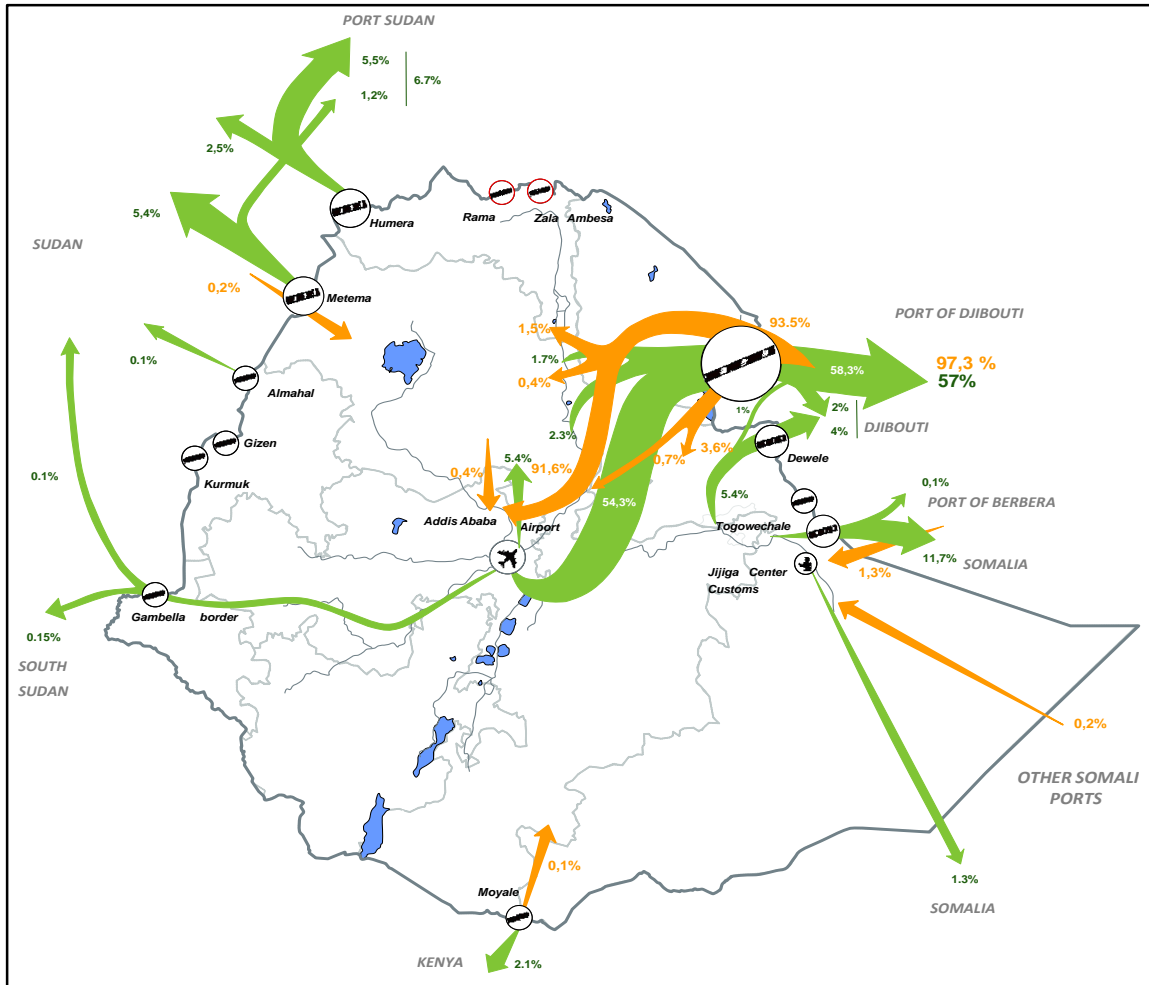
Unimodal exports are loaded onto trucks at the customer’s warehouse or plant and transported as breakbulk in transit to the Port of Djibouti for container stuffing, border clearance, and loading onto vessels for export. A large proportion of Ethiopia’s containerized exports are stuffed in Djibouti, which is contributing to empty running and inefficiencies in the system. More than 85 percent of imports are aggregated in Addis Ababa, before being distributed around the country by road, as the road network is the primary mode of transport connecting all regions within Ethiopia. The Central Region, which comprises of the city of Addis Ababa, consumes the bulk (50 percent) of imported cargo. In addition to dry ports, there are also container freight stations for receiving both inbound and outbound container shipments.

8.11 Main Export and Import Routes and Products

Ethiopia’s leading export is coffee and most of the exporters are located near Addis Ababa. The main export items include coffee, fruits and vegetables, oilseeds, meat products, leather products and garments. They sell to overseas buyers, primarily roasters. Coffee beans are transported to the Port of Djibouti in hired trucks. The cost of transport is about ETB 60 per 100 kg (about US\$33 per ton or US\$750 per TEU). The bags are loaded into

containers mostly either at the Port of Djibouti or at the exporter’s warehouse for large exporters.

Map 8.6: Combined Export-Import Flow Map showing the dominance of the Addis-Djibouti Corridor

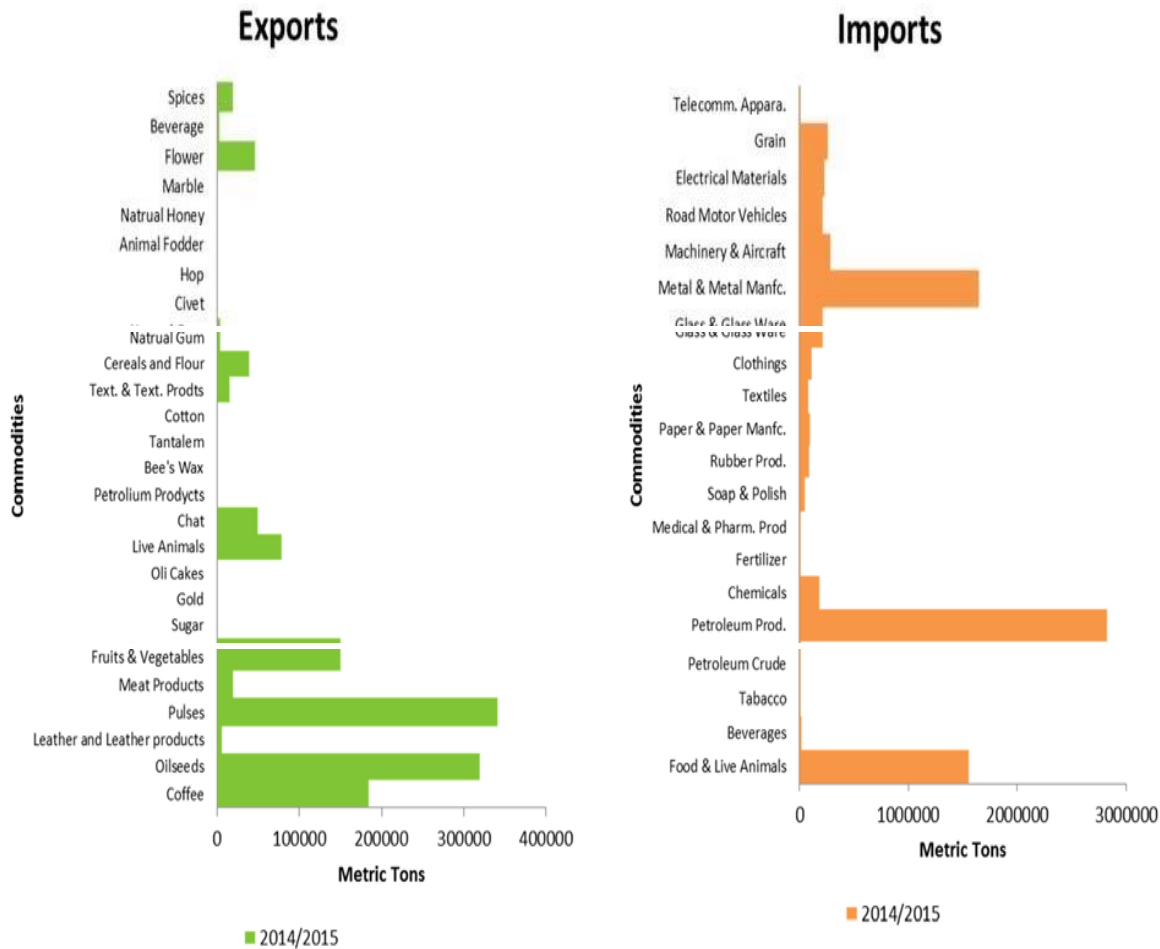


Source: Ethiopia Trade Logistics Project (P156590)

The main import cargo flows are containerized cargo, bulk shipment (mainly fertilizer and grain) and break- bulk imports (mainly steel). The main bulk imports are grains and fertilizers. Ethiopia imports grain to supplement its own production. Most of the importers of containerized imports are in and around Addis Ababa. Modjo serves the majority of multimodal containerized imports. Currently, imported products are stored at Modjo in containers and the containers are unstuffed at their final destination. The average dwell time in the port for a container is 55–60 days. This leads to significant costs and delays

in the inefficient use and allocation of containers, in congestion in the dry port and poor management of the facility.

Figure 8.9 Volume of Export and Import Items



8.12 Summary and conclusion

According to the 2016 Logistics Performance Index (LPI), Ethiopia ranked 129 out of 160 countries, and performed poorly compared to peer countries. A similar picture also emerges from the Global Competitiveness Index produced by the World Economic Forum (WEF) in which Ethiopia ranked 126 out of 141 countries in 2019 and 126 out of 169 on DHLs 2020 Global Connectedness Index. The impact of the inefficiency and challenges in trade facilitation is further reflected in the World Bank Doing Business 2020, where

Ethiopia is ranked 156 out of 190 countries. The Africa RI Index also shows the low performance of Ethiopia, especially on trade integration compared to Kenya and Uganda. These macro level indicators though not definitive, confirm the transport connectivity and logistics challenges facing Ethiopia. High logistics costs are all major constraints for any part of the economy that requires transportable products to be processed through a value chain be they inputs like fertilizers, or final products like manufactured t-shirts or processed coffee.

Logistics performance (LPI) is the weighted average of the country scores on the six key dimensions of :- (i) Efficiency of the clearance process; (ii) Quality of trade and transport related infrastructure; (iii) Ease of arranging competitively priced shipments; (iv) Competence and quality of logistics services; (v) Ability to track and trace consignments; and (vi) Timeliness of shipments in reaching destination within the scheduled or expected delivery time. There is a lot of work to be done in both Ethiopia and Djibouti on all six LPI fronts and Ethiopia scores extremely low on the goods market efficiency and the infrastructure pillars (124 out of 137 countries and 115 out of 137 respectively). On a positive note, performance has been on an upward trajectory with Ethiopia being one of only 4 African countries that have improved for five consecutive years. It is therefore an economic imperative for Ethiopia to continue to reduce its economic distance to markets through improved transport infrastructure, but also to significantly lower the logistics costs of its trade, especially on the noted non-tariff barriers.

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