Ethiopian Maritime Affairs Authority (EMAA)

CONSULTANCY SERVICES FOR DEMAND ANALYSIS AND DETAIL DESIGN PREPARATION OF MODJO GREEN LOGISTICS HUB UNDER THE ETHIOPIA TRADE LOGISTICS PROJECT (ETLP)

FINAL REPORT
Component 1: Preparation of Preparatory Studies

Modjo intermodal facility - Source: Sellhorn-HPC, October, 2018

Sellhorn INGENIEURGESELLSCHAFT

HPC

Ethiopian Maritime Affairs Authority (EMAA)

CONSULTANCY SERVICES FOR DEMAND ANALYSIS AND DETAIL DESIGN PREPARATION OF MODJO GREEN LOGISTICS HUB UNDER THE ETHIOPIA TRADE LOGISTICS PROJECT (ETLP)

[REF.: ET-EMAA-4950-CS-QCBS]

FINAL REPORT

COMPONENT 1: PREPARATION OF PREPARATORY STUDIES

Sellhorn Ingenieurgesellschaft mbH
Teilfeld 5
20459 Hamburg
Germany
Phone: +49-40-361201-0
Fax: +49-40 361201-28
E-Mail: info@sellhorn-hamburg.de
Internet: www.sellhorn-hamburg.de

HPC Hamburg Port Consulting GmbH
Am Ballinkai 1
21129 Hamburg
Germany
Phone: +49-40-74008-123
Fax: +49-40-74008-133
E-Mail: info@hpc-hamburg.de
Internet: http://www.hpc-hamburg.de

Rev.	Date	Prepared by	Remarks
0	24/11/2018	Harmon, Busse, Zernikow, Cardebring	Frist Draft
1	23/12/210	Harmon, Busse, Zernikow, Cardebring, Léger, Bahizi	Progress Draft
2	26/01/2019	Harmon, Busse, Cardebring, Léger, Bahizi	Draft Report
3	20/02/2019	Harmon, Busse, Cardebring	Draft Final
4	27/02/2019	Harmon, Busse, Cardebring	Final
5	18/03/2019	Harmon, Busse, Cardebring	Final (rev.)

TABLE OF CONTENTS

Page

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

AfDB	African Development Bank
ASYCUDA	Automated Systems for Customs Data
AU	African Union
CAGR	compound average growth rate
CCTV	closed circuit television
CIMMYT	International Maize and Wheat Improvement Centre
CRGE	climate resilient green economy
DMP	Doraleh Multi-Purpose Terminal, Djibouti
DPOIS	Dry Port Operation Information system
ECA	UN Economic Commission for Africa
ECC	Ethiopian Customs Commission (under Ministry of Revenue)
EFFSA	Ethiopian Freight Forwarders and Shipping Agents Association
ERC	Ethiopian Railway Corporation
ERCA	Ethiopian Revenue and Customs Authority (now ECC)
ESLSE	Ethiopian Shipping & Logistics Services Enterprise
FDRE	Federal Democratic Republic of Ethiopia
GDP	Gross Domestic Product
GoE	Government of Ethiopia
GTP II	2nd Growth and Transformation Plan
ICD	Inland Clearance Depot
ICT	Information and Communication Technology
IGAD	Intergovernmental Authority on Development
ILH	Integrated logistic hub
IMF	International Monetary Fund
IT	Information Technology

LCL	Less than Container Load
LPI	Logistics Performance Index
EMAA	Ethiopian Maritime Affairs Authority
MDP	Modjo Dry Port
MGLH	Modjo Green Logistic Hub
MMT	Multimodal Transport
NPV	Net present value
PPP	Public/Private Partnership
Ro-Ro	Roll on / Roll off operation
RTG	Rubber-tired Gantry
RMG	Rail-mounted Gantry
SGTD	Société de Gestion de Terminal á Conteuneur de Doraleh
TEU	Twenty foot equivalent unit (standard container size)
TLC	Total Logistics cost
TOS	Terminal Operating System
3PLs	Third Party Logistics Service Providers
5C method	Analysis considering **C**ompany, **C**ollaborators, **C**ustomers, **C**ompetitors, and **C**ontext.

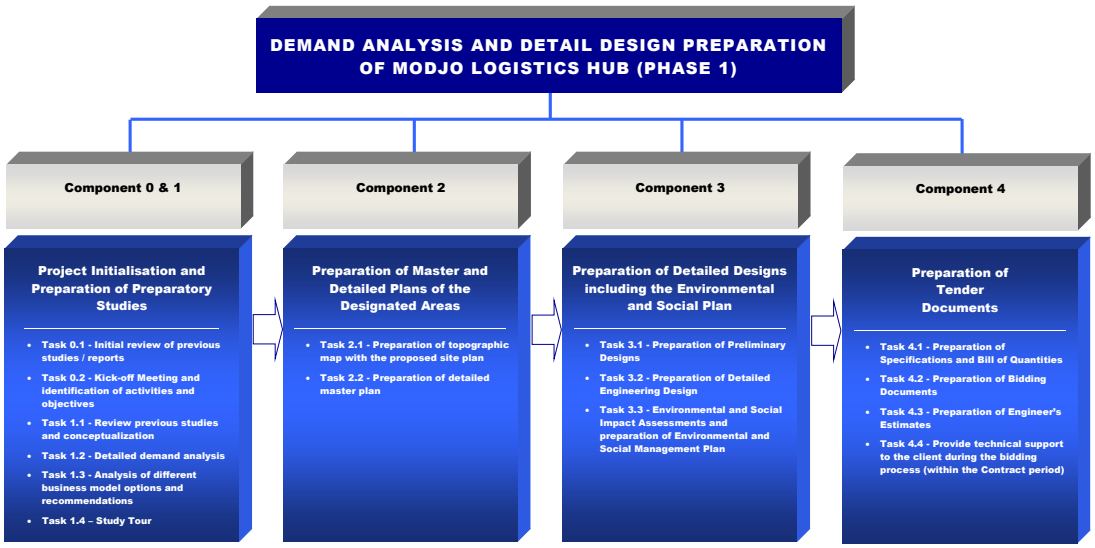
GLOSSARY

Container dwell time	The period of time a container spends on a terminal in the same condition between being delivered and being despatched
Multimodal transport	Door-to-door service with single administrative document (SAD) from the point of loading to the point of destination solely provided by ESLSE.
Truck dwell time	The period of time a truck spends on the terminal's premises from entering through the in-gate and leaving through the out-gate.
Unimodal transport	Includes clearing & forwarding of import and export cargoes. The service is rendered at Djibouti Port and inland dry ports. ESLSE facilitates clearance, arrangement of trucks and forwarding from and to Djibouti port.

1. INTRODUCTION

This Draft Final Report is elaborated in the context of Phase 1 of the assignment *Demand Analysis and Detailed Design Preparation of Modjo Green Logistics Hub under the Ethiopia Trade Logistics Project (ETLP)*. The Phase 1 is structured in four components. The four components are shown in the following figure.

Figure 1: Proposed Components and Associated Tasks



Source: Sellhorn, 2018

The Component 0 is the Inception Report, the final version of which was been submitted on 19th November 2018.

This *Component 1 Report - Preparation of Preparatory Studies* elaborates the basis for the physical design of the Modjo Green Logistics Hub (MGLH) regarding market demand for services, identification of suitable commodity types, expected development of cargo volumes, required capacities to handle those volumes and suitable business model options.

In this report, the Consultant explains in detail the methodology and elaborated results, findings and recommendations for Component 1 Preparation of Preparatory Studies with their associated tasks, their objectives and descriptions as well as the expected outputs to be delivered.

Within this document the Consultant provides information on data that has been collected from the market and its stakeholders, from the client, EMAA, and from public sources from JV's data bases.

It is envisaged that this report will provide a reflection on demand and logistics requirements of the market. The market is shaped by stakeholders such as importers, exporters, Ethiopian Shipping & Logistics Services Enterprise (ESLSE) logistics providers, the Ethio-Djibouti Railway Company, trucking companies, commodity traders as well as representatives of industry associations.

2. DETAILED DEMAND ANALYSIS

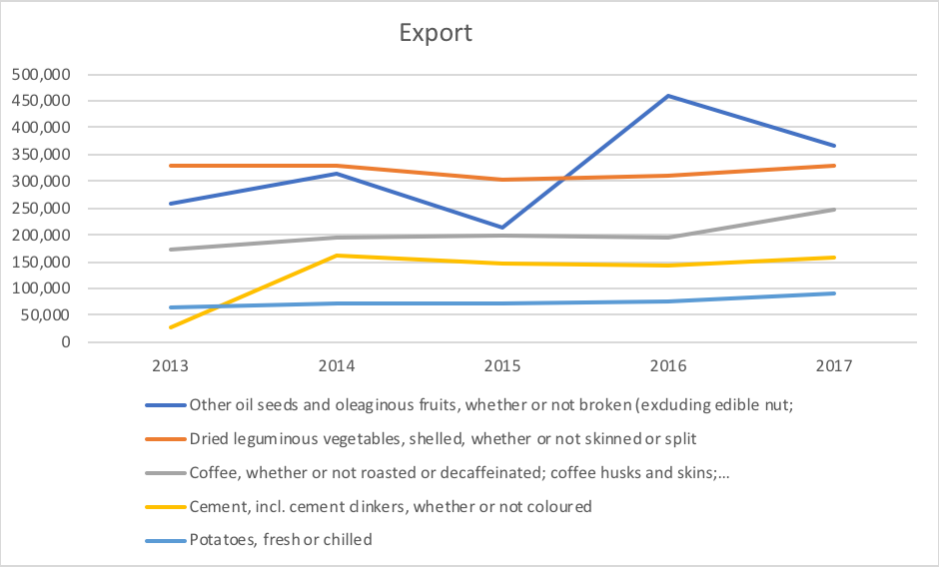
The optimal logistics hub design is defined by the environment and market in which it operates. This environment and the related framework conditions are influenced by involved companies, industries nearby, and the way how current cargo flows can be transformed to Modjo Green Logistics Hub (MGLH) related supply chains. The role of the MGLH in the network might be central, regional, or local oriented – depending on the commodity. The basic infrastructures available, like road and rail connection and land availability, as well as the opportunities provided by the geographic location, have an impact on the design of the MGLH plot. By the market analysis the Consultant evaluates the potential market demand for the MGLH based on its comparative and competitive advantages, undertakes a functionality and requirement analysis, and elaborates identified suitable business model options.

2.1 Market Environment Analysis

At the beginning of this task, the Consultant analysed the overall market environment. The first step of the assessment of the market environment covers the present trade patterns and networks between the wider Modjo Dry Port region and the port of Djibouti, which is used as a foundation for the later traffic forecast. Furthermore, the assessment of the market environment includes an analysis of the current status of freight logistics industry in Ethiopia.

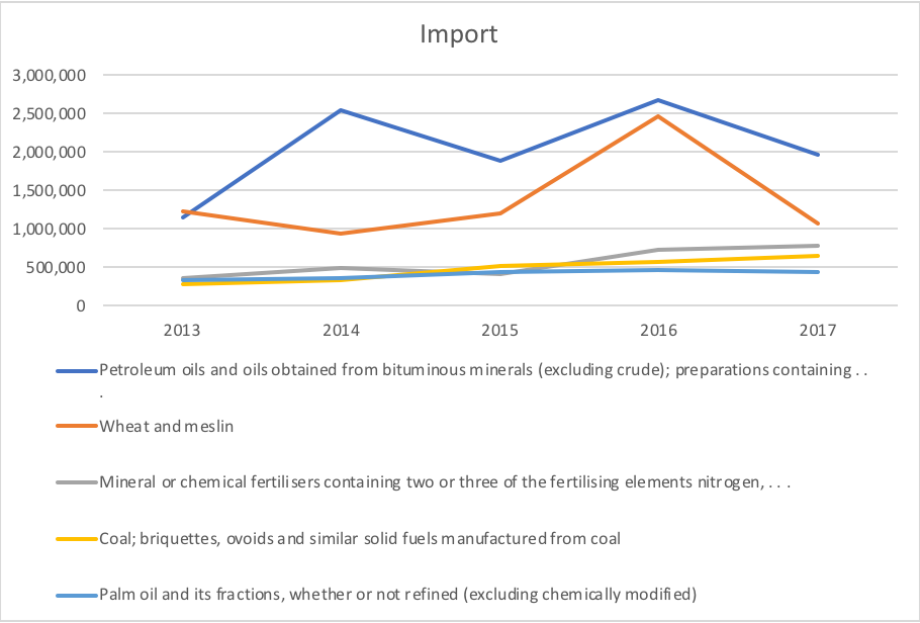
In evaluating trade by value, exports are primarily agricultural, while imports are primarily technical and resource based. Since the weight of products is very important its planning of transport and logistics, the tables below illustrate the leading exports and imports by quantity. The ranking shifts somewhat. For example, coffee which is Ethiopia's most important export by value is third in importance by tonnage.

Figure 2: Top 5 Ethiopian Exports by Quantity (Tonnes)[1]



Source: Trademap, 2018

Figure 3: Top 5 Ethiopian Imports by Quantity (Tonnes)[2]

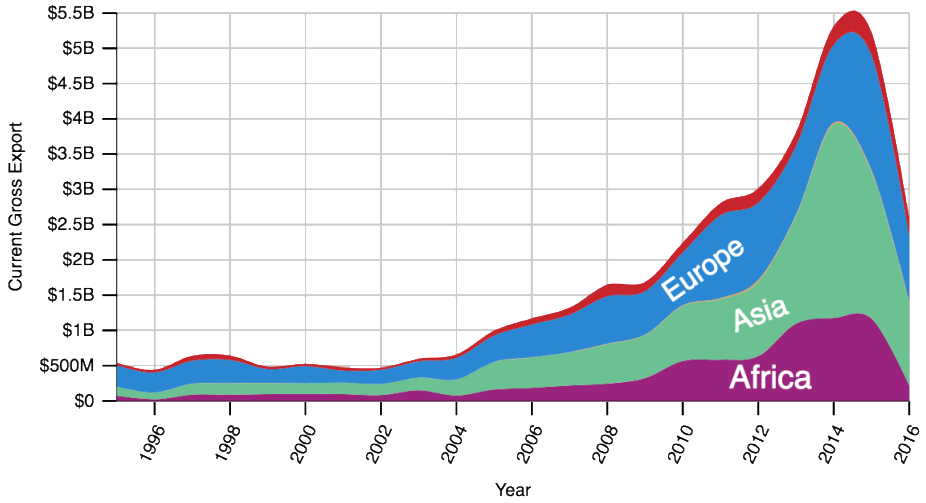


Source: Trademap, 2018

[1] Related table see Annex 4

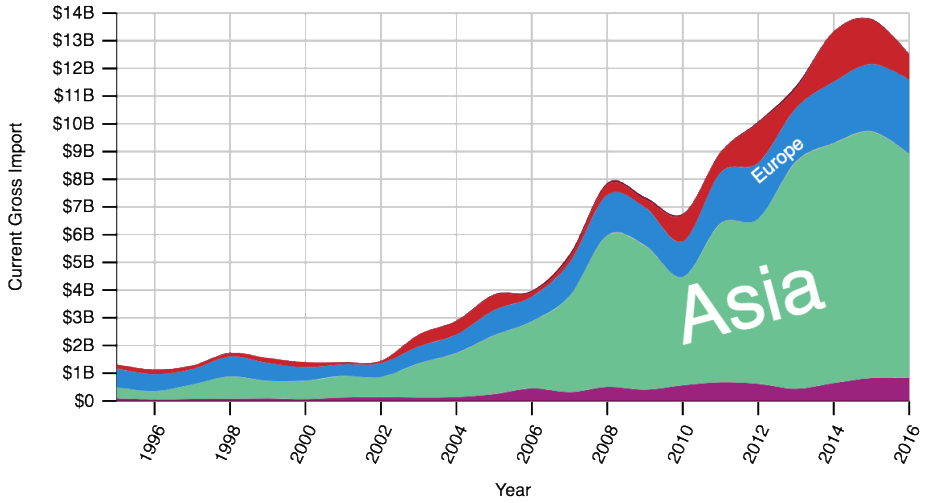
[2] Related table see Annex 4

Figure 4: Destinations of Exports between 1996 and 2016



Source: Centre for International Development, The Atlas of Economic Complexity, Harvard University
(Note: Red is North America)

Figure 5: Origins of Imports between 1996 and 2016



Source: Centre for International Development, The Atlas of Economic Complexity, Harvard University
(Note: Red is North America, purple is Africa)

Ethiopia is a very rural country with a population of around 100 million living in a land area of 1,105 square km. Many of the agricultural products are produced at the homestead level and sold to processors and exporters. Because of the size of the population and land area, the quality and efficiency of transportation and logistics are essential to economic well-being and development. Logistics services, manufacturing

and agricultural warehousing are centred around the capital of Addis Ababa. Nevertheless, decentralizing economic activity to other cities and regions is a priority of the Ethiopian Government.

As a landlocked country, Ethiopia is very dependent on trade corridors and cooperation with neighbouring countries to ensure meeting its trade objectives. The road and rail connection to Djibouti, which follows the rift valley through Ethiopia for a gradual descent, has been increasingly important to Ethiopia since Eritrea separated from the rest of Ethiopia. Since Djibouti and Ethiopia have invested in a standard gauge railway from the Djiboutian port terminals to Addis Ababa, it is likely that Djibouti will retain its position as Ethiopia's leading port for some time. Currently, about 90-95% of Ethiopian trade uses the Djibouti Trade Corridor.

There is a major imbalance in the volume of imports and exports from Ethiopia. This is illustrated in the following table.

Table 1: Trade Balance on the Ethio-Djiboutian Corridor

	2013		2017	
	Quantity (tonnes)	Percentage	Quantity (tonnes)	Percentage
Total Exports	1,339,404	15%	1,767,963	13%
Total Imports	7,343,062	85%	11,419,237	87%
Total Trade	8,682,466	100%	13,187,200	100%
Source: Trademap.org				

As a result of the imbalance, most Ethiopian trucks assume they will drive from Ethiopia to Djibouti without a load. For this reason, transporters generally set their import fares high enough to cover costs for the roundtrip. When the transporter has an export haul (back load), the rate is generally reduced. This is done for both road and rail and benefits the exporter. In the long run, greater balance of trade should reduce the price of the import haul, however, Government of Ethiopia (GOE) initiatives might still encourage lower export rates to encourage more exports.

2.1.1 Situational Analysis

Ethiopia is one of the fastest-growing economies in the world. The economy has been growing in double digits for the last ten years. Ethiopia has set a goal of becoming a middle income country by 2025 and its plan for achieving this goal is set out in the Second Growth and Transformation Plan (2015/16 – 2019/20), which includes:

- Sustaining rapid, broad based and equitable economic growth and development
- Increasing productive capacity and efficiency for agriculture and manufacturing industries
- Enhancing the capacity of the domestic private sector
- Accelerating human development and technological capacity
- Building a green economy

Strengthening productive capacity and increasing exports will require a high performance logistics system. Logistics is the process of planning, implementing and controlling procedures for the efficient and effective transport and storage of goods and services, and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements.[3] This definition assumes three flows: the flow of information, the flow of cargo and the flow of transactions (including regulatory compliance). Recognizing the importance of logistics to achieving economic goals, GoE commissioned a National Freight Logistics Strategy for Ethiopia, which was completed in October 2015 and established a Logistics Transformation Office (LTO). The LTO's importance is emphasized by its presence in the Prime Minister's Office.

The World Bank produces the Logistics Performance Index every two years. The best country is given number one, therefore the lower the score the better it is. Due to missing values for 2018 (see Annex 1 of WB LPI Report 2018), Ethiopia was not included in the 2018 Index (but mentioned as ranked 131st place). In the previous three reports, Ethiopia has mostly shown improvement. In 2012, it scored 141 out of 155 countries, in 2014 it improved to 104, but then it dropped in 2016 to 126. Each country is ranked on 6 categories, with 1 being the lowest score and 5 the highest. In 2016, Ethiopia had the highest scores in (1) Customs and other regulatory agencies (2.60), and (2) international shipments (2.56), middle scores in logistics competence (2.37) and timeliness (2.37), and the lowest scores in tracking and tracing (2.18) and infrastructure (2.12). This suggests that Ethiopia should put particular effort on improving infrastructure and tracking and tracing, although all categories should be improved, since Ethiopia's scores are all in the middle range.

[3] Council of Supply Chain Management Professionals

Recent studies about the Ethiopian logistics sector have shown important constraints:

- High dwell time of imported goods at both the sea and dry ports;
- Imbalance of import and export traffic with a major number of empty return hauls;
- Low rate of local containerization of export cargo causing inability to capitalize on abundant empty import containers;
- Poor and unreliable logistics services (technology, skills, capital, management, trade finance constraints);
- Highly fragmented road freight transport services sector with old and generally inappropriate vehicles and low levels of service professionalization;
- Inadequate trade related infrastructure (Inefficient logistics facilities that brings together an integrated set of services and logistics solutions);
- Absence of value added logistics services, such as inventory management or bonded warehousing;
- Congested and inefficient road traffic, just nascent rail system; and
- Significant maintenance and safety issues in the road sector.

In 2016, the EMAA/Logistics Transformation Office summarized the situation as follows: "Ethiopia's trade competitiveness features with many issues including long transit time, higher logistics cost, lower port lifting capacity, higher port dwell time, and fragmented service delivery, among others compared to various economies and income groups. In general, Ethiopia's freight logistics does not match the nation's present economic development and falls short of global best practices."

Ethiopia's trade logistics lacks competitiveness. It is characterized by structural problems; underdeveloped logistics infrastructure in terms of physical structures and technology; systemic problems in the way logistics services are operated by national providers ; and lack of a competent and knowledge workforce in the logistics sector capable of leading and managing the sector to be more competitive.

Ethiopian international trade logistics services are increasing in volume and value; becoming more complex in terms of on time delivery, quality packing, and facing demand from cargo owners/shippers to reduce entire logistics cost across the supply chain and to enhance maximum value added services from logistics function. In addition, there is an expectation to balance the huge trade deficit that persisted in the Ethiopian imports versus exports. These factors led GOE to rethinking logistics functions in Ethiopia to enhance efficiency, quality, and on time delivery of goods to sustain Ethiopia's international trade competitiveness and ultimately to improve its global position as evaluated in the Logistics Performance Index and other international measures.

In principle, Ethiopia needs a logistics system capable of underpinning the growing Ethiopian economy by catalyzing the free movement of goods, information, funds and people mobility within the country, with neighboring East and Southern African Countries, the Middle East, the African continent and the globe at large. As more foreign direct investment is attracted to Ethiopia because of offshoring strategy driven by low cost of resources with quality materials, high potential for value addition such as coffee, leather and other agro-processing industries in the industrial zones or parks, the function of logistics in terms of procuring, packing, stuffing, moving, containerizing, warehousing, customer services and other value added services to expedite its movement to the required destination with the right quality, time and price is found to be a necessity.

Modjo Dry Port was designed to provide a facility for clearing imports within the national territory. It was developed in tandem with a multimodal system, which was designed to clear goods in less than five days from Djibouti and allows them to be removed in bond to Modjo Dry Port. The system is operated by the Ethiopian Shipping and Logistics Service Enterprise (ESLSE), which is made up of the state owned shipping line, forwarding company, transporter and operator of Ethiopian dry ports. Bilateral operations are supported by a bilateral customs agreement, a bilateral transport agreement and several bilateral commissions comprised of agencies concerned with the trade and transport that seek to resolve issues that hinder effective trade.

The situation analysis consists of several methods of analysis, as presented below: The 5 Cs analysis and the SWOT analysis 5C analysis is a method to analyze the environment in which a company operates. It can provide insight into the key drivers of success, as well as the risk exposure to various environmental factors. The 5Cs represent the considered aspects of Company (Modjo Dry Port & ESLSE), Collaborators (related ministries and authorities), Customers (exporters, importers, etc.), Competitors (e.g. other dry ports), and Context (based on PESTEL and enhanced by SWOT analysis).

The situational analysis looks at both the macro environmental factors that affect the logistics sector in general and Modjo Green Logistics Hub in particular, and the micro environmental factors that specifically affect the current Modjo Dry Port operation. The purpose of this situational analysis is to indicate the logistics situation in general and Modjo Dry Port in particular – its current position, as well as the overall logistics business environment in Ethiopian context.

- First, Modjo Dry Port with major Government stakeholders and collaborators will be analyzed according to their direct relationship and effect on Modjo Dry Port as regulators and owners.

- Secondly, ESLSE's current operation and strategic direction will be analyzed in connection to the current Modjo Dry Port and future Modjo Green Logistics Hub.
- Thirdly, the competitor analysis will be described in connection with competing and rival uses of dry ports in Ethiopia.
- On the fourth part, the customer analysis will be undertaken. It will be elaborated further in the demand analysis.
- In the fifth part, context analysis of logistics sector and Modjo Green Logistics Hub will be made which comprises of the PESTEL (political, economic, social, technological, environment and legal environment of the logistics sector in Ethiopia to be analyzed in detail), followed by SWOT analysis with SWOT matrix of the logistics sector decision issues.

2.1.1.1 Modjo Dry Port

Modjo Dry Port Terminal started its operation in 2009. It is currently owned and operated by ESLSE. It is the state owned monopoly company, responsible for shipping, multimodal operations, the dry port and a domestic logistics service with its own trucks. When operations at Modjo started the originally size of the plot has been 62 hectares of which 2.5 hectares have been utilized in the first phase. The 62 hectare plot has a master plan for the required facilities to provide logistics services at the port. On the other hand, with the funding of World Bank, it has secured an additional 120 hectares of land for Modjo Dry Port expansion to transform it in to MGLH.

Strategic decisions made during establishment of Modjo Dry Port account set two objectives: i.e, to reduce Djibouti Port dwell time of cargoes by establishing alternate cargo storage at the dry port and hence reduce demurrage costs, reduction of expenses incurred in USD rather than ETB, and to facilitate import/export trade logistics.

Modjo Dry Port has warehouse facilities: the warehouse is landed in 21,600 m² with the capacity to inspect 160 containers at a time. Furthermore, standard container terminal facility is landed on 27.84 hectare, and at a time, the port has the storage capacity to serve 14,908 TEU. Currently around 7,000 40' containers and 9,000 20' containers are stored at Modjo Dry Port.

For the past seven years, the yearly imported container handled at the Modjo Dry Port are summarized and presented as shown below.

Table 2: Full Import Container handled at Modjo 2012-18

	Condition	Unit	2012	2013	2014	2015	2016	2017	2018
Modjo Share of Dry Ports	Full in	%	54.9%	64.9%	63.7%	75.3%	78.6%	78.6%	79.1%
Modjo Volume	Full in	TEU	10,786	39,461	54,044	86,160	124,949	133,070	130,747
Growth	*Full in*	*%*		*265.9%*	*37.0%*	*59.4%*	*45.0%*	*6.5%*	*-1.7%*

Source: Based on data received by EMAA and Market Survey

The 2018 figure of 130,747 TEU represents about 79% of market share of all dry ports in Ethiopia and 44% market share of imported containers to Ethiopia.

The current situational analysis of Modjo Dry Port revealed the following problems:

- Difficulties in locating containers received at the dry port
- Poor database to record containers arrival; i.e. missing a letter or number that makes searching containers difficult
- Shortage of machineries, such as forklifts, reach stackers and cranes, to load and unload containers from rail and trucks
- Poor infrastructure and the dry port is congested often
- Misplacing of containers; sending Modjo shipments to Kality station or Kality station shipments to Modjo.

Ethiopian import- and export logistics, where the dry port is a key facilitator of logistics service, is shaped by the interface among three levels of stakeholders: (1) infrastructure developers and financiers, such as the Ethiopian Roads Authority and Ethiopian Rail Corporation; (2) regulators, such as Ethiopian Maritime Affairs Authority, Federal Transport Authority, Ministry of Transport, Ministry of Agriculture, Food, Medicine and Health Care Administration and Control Authority (FMHACA), Customs Commission, etc.; and (3) operators, such as Ethio Djibouti Railway S.C., transporters and logistics service providers. The effectiveness and competitiveness of Ethiopian logistics in the international trade depends on how well these three groups play their role as infrastructure developers, regulators, and operators. Lack of coordination among any of the key stakeholders in their respective role will result in poor logistics performance, and likely result in higher cost, long delivery time, poor safety, etc. On the other hand, the multiple authorities involved in trade and transport are insufficiently coordinated adding to the time and cost of trade operations and compliance.

Implementation of the Logistics Strategy is critical to achieving Ethiopia's economic objectives, gaining economic advantage from its high population/domestic market and it geographic location which makes it a bridge between Africa, Europe, Middle East and Asia.

To realize Ethiopia's logistics hub of East Africa for four continents by 2030, the Federal Government of Ethiopia should work to establish an integrated logistics service environment with all stakeholders to build best logistics infrastructure (physical, human, IT, legal) in East Africa that provides streamlined logistics service for goods from origin to destination enabling Ethiopia's trade competitiveness in the international market in a sustainable way.

The following the most relevant key stakeholders are described in regard to their impact on logistics performance, especially dry ports in Ethiopia.

a) Ministry of Finance

The role of Ministry of Finance in allocating adequate budget for standard logistics infrastructure development in all aspects affects the way import/export logistics services are provided to the cargo owners.

b) Ministry of Transport

The Ministry of Transport oversees the key stakeholders in the road, rail and air transport on the three roles (infrastructure, regulator, and operator) which are: Ethiopian Roads Authority and Ethiopian Roads Construction Enterprise; and Ethiopian Rail Corporation; Ethiopian Aviation Authority, and Ethiopian Airlines; Ethiopian Maritime Affairs Authority, and Ethiopian Shipping and Logistics Service Enterprise; and Federal and regional state transport authorities. Though major logistics stakeholders are coordinated and controlled under the Ministry of Transport of Ethiopia, the accountability of the Customs Commission and National Bank is to another Ministry.

c) Ethiopian Maritime Affairs Authority

The Ethiopian Maritime Affairs Authority is mandated to carry out maritime related duties to ensure success on its key mandate of reducing transit time and cost of import and export through coordinate effort of different stakeholders. The purposes for which the Authority is established are as follows:

1. Ensure that the transport operations and movement of goods in import and export of the country are economical; plan, coordinate and enforce such operation;

2. Reduce the transit time of import and export of goods, and coordinate the concerned Government bodies to care for goods at port;

3. Seek ways and means for the promotion and development of multimodal transport, marine transport, and inland water transport and ensure the availability of uninterrupted resources of skilled man power in the maritime sector for the country;

4. Ensure performance of Ethiopia's trade corridors and maintain port user agreements with main ports being used, and participate in bilateral commissions to improve corridor operations;

5. Implement obligations and rights of Ethiopia under international maritime conventions.

d) Ministry of Revenue (including the Customs Commission)

The Ethiopian Revenue and Customs Authority was established as an autonomous federal government agency having its own legal personality. Recently, the Authority was upgraded to Ministry of Revenue, with customs established as the Customs Commission accountable to the Ministry of Revenue. The Ministry has the following objectives:

1. To establish modern revenue assessment and collection system; and provide customers with equitable, efficient and quality service;

2. To cause taxpayers to voluntarily discharge their tax obligations;

3. To enforce tax and customs laws by preventing and controlling contraband as well as tax fraud and evasion;

4. To collect timely and effectively tax revenues generated by economies;

5. To provide the necessary support to regions with a view to harmonizing federal and regional tax administration systems.

e) Ministry of Agriculture

The Ministry of Agriculture (MoA) is the Ethiopian government ministry which oversees the agricultural and rural development policies of Ethiopia on a Federal level. It is directly related to the seasonal import logistics services mainly on the import of bulk goods in huge quantities of fertilizer for Ethiopian framers.

f) Ethiopian Freight Forwarders and Shipping Agents Association

EFFSAA (Ethiopian Freight Forwarders and Shipping Agents Association) is a private national association of professional logisticians striving since 1998, engaged in freight forwarding and shipping sector in Ethiopia. As Modjo multi user facility is expected to be open to private logistics service providers, members of EFFSA are likely to actively engage in the use of Modjo logistics hub as a major stakeholder in the import/export logistics industry of Ethiopia.

g) Customs Clearing Agents

Customs Clearing Agents deal with the customs, for and on behalf of another person, to carry out customs formalities related with the import, export and in general with the movement and storage of such goods within the customs territory of Ethiopia. Currently, Ethiopian Customs Commission is physically located for the customs process at Modjo logistics Hub and these customs clearing agents are the main stakeholders to frequently transact among multiple logistics players at Modjo dry port facility.

2.1.1.2 Ethiopian Shipping and Logistics Services Enterprise (ESLSE)

Ethiopian Shipping and Logistics Services Enterprise were established based on the merger of three state owned Enterprises. Namely: Ethiopian Shipping Lines S. C, Maritime and Transit Services Enterprise and Dry Ports Enterprise. Currently, ESLSE is a sole multimodal transport operator and owner and operator of the dry ports in the country.

The Enterprise provides the following services:

1. Shipping service division: The main focus of this division is to provide coastal & international marine transport to and from Djibouti Port. The shipping sector provides uninterrupted sea transport services between ports with own ships & slot chartering of ships of major carrier.

    a. Own vessels: ESLSE owns and manages 11 vessels. Nine of which are dry cargo ships with a total dead weight of 246,185 tonnes and the other two are oil tankers, with total dead weight of 83,000 tonnes. Nine of these vessels are brand new, that were built recently.

2. Freight forwarding division: This division is concerned with clearing & forwarding of import and export cargo multimodal transport.

a. Multimodal transport: This is a door-to-door service with single administrative document (SAD) from the point of loading to the point of destination.

b. Unimodal: This includes clearing & forwarding of import and export cargoes. The service is rendered at Djibouti port. The role of ESLSE is to facilitate clearance, arrangement of trucks and forwarding from and to Djibouti port.

3. The port & terminal division: This division manages import & export trade at seaports and dry ports, where goods are loaded, customs formalities are completed; goods are temporarily stored; stuffing & un-stuffing activities take place and made ready for transport; and distributed to their final destinations.

2.1.1.3 Competitor Analysis

Other existing dry ports and proposed dry port projects to be implemented in the future haven been identified as the most relevant potential competitors. With the current majority market share (79%) held by Modjo Dry Port for containerized import cargo handling, and the government decision to transform Modjo Dry Port into Green Logistics Hub by investing and expanding its current infrastructure, and expected multi-user facility beyond cargo handling to full-fledged value-added third party logistics services, Modjo Green Logistics Hub will continue to serve as an important logistics facility centre in the coming medium- to long-term, knowing that no immediate or future competitors or logistics facility projects will take over the role comparable to the proposed Modjo Green Logistics Hub. This is mainly due to its strategic location to the ports of Djibouti, Assab, and Berbera, as well as the current significant investment (road, rail, terminals, etc.) to develop MGLH to serve both import and export logistics for cool chain facilities and industrial parks in an integrated way.

Currently there are six container dry ports in operations in Ethiopia. The share of of all cargoes that are handled by dry ports in Ethiopia for each dry port in 2017 is shown in brackets below:

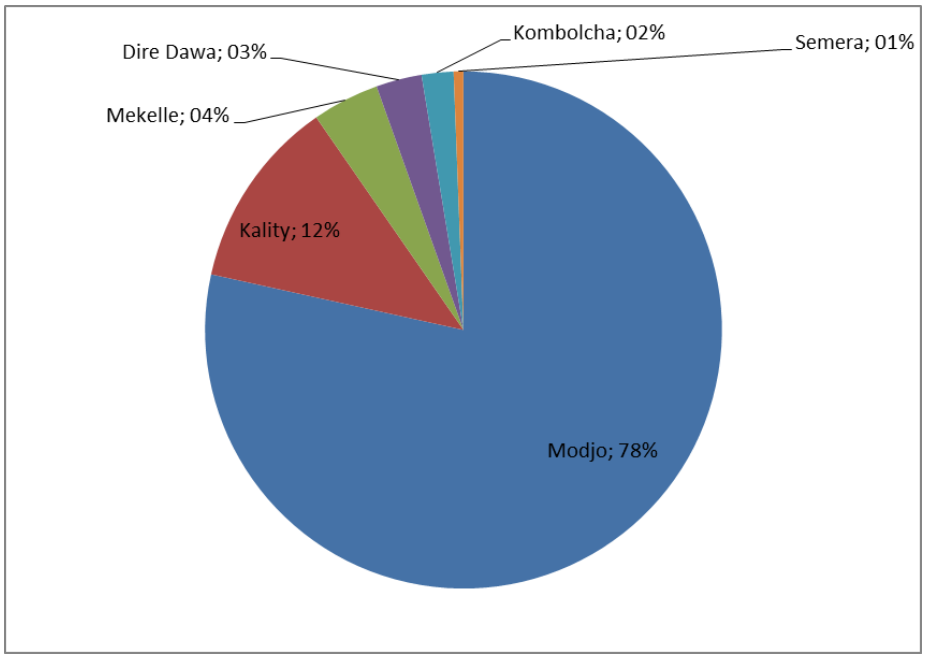
- Modjo (78%),
- Kality (12%),
- Mekelle (4%)
- Dire-Dawa (3%)

- Kombolcha (2%), and
- Semera (1%)

There is also a seventh dry port at Gelan, which is currently not used for container and therefore not integrated in the above mentioned list. But Gelan is currently used for vehicles (mainly 3t passenger cars) which are brought by car transporter from Djibouti. Also single cars are arriving at Gelan. They are driven by a Djiboutian driver from Djibouti to Samara and from there to Gelan by an Ethiopian driver.

The following figure shows the distribution of the market shares of the six container dry port mentioned above.

Figure 6: Share of Handled Full Import Container per Dry Port Location (2017)



Source: Based on data received by EMAA

In addition, ESLSE has indicated in its strategic plan the construction of new dry ports and the expansion of existing terminals. Besides the MGLH project which is called Modjo 4th Dry Port (expansion) these are:

- Dire Dawa Dry Port (expansion),
- Hawasa Dry Port,

- Woreta Dry Port,
- Kombolcha Dry Port (expansion),
- Mekelle Dry Port (expansion),
- Jijjga Dry Port,
- Moyale Terminal,
- Jimma Dry Port, and
- Nekemte Dry Port.

Current and future developments of privately owned and financed comparable logistics facilities are not known. Participation in the logistics sector was actually reserved for Ethiopian companies until recently when it was opened by a governmental decision in Fall 2018 for joint ventures of local logistics companies and international logistics service providers allowed to hold a share of up to 49% in such a company. This opening for foreign investors is not assessed as additional completion, but as the opportunity to increase the quality of utilization of the upcoming and existing dry ports. This allows e.g. packaging, forwarding and operations of shipping agency services as well as the provision of bonded warehouses, consolidation and deconsolidation services.

The action is expected to welcome international companies to engage in logistics services. Ethiopian Airlines is aggressively working with strong local, regional and international passenger and cargo flight networks. In addition, according to different sources, DHL Global Forwarding has working on joint venturing with Ethiopian Airlines to further enhance the country's logistics and international trade connections.

The logistics industry is expected to be tense if different international companies entered in rendering logistical services and; this is a signal for ESLSE to do more in order to be profitable and to get high market share in the industry.

With regard to private logistics service providers in Ethiopia where transporters, freight forwarders, shipping agents are actively engaged in the import export logistics services of Ethiopia, they are expected to actively seek foreign partners to joint venture to engage in the broader logistics value added services in 3rd party or 4th party logistics service provision, or merger with each other to consolidate their logistics asset and emerge as a potential competitor for ESLSE, which is a sole operator especially in multi modal transport operation.

2.1.1.4 Customer Analysis

Based on the data obtained from Ethiopian Freight Forwarders and Shipping Agents Association (EFFSA, 2018), as well as literature, the following situational analysis on the existing importers, exporters and logistics service providers are made in the context of Ethiopian import/export logistics in terms of the current challenges and the way forward to alleviate the existing challenges.

The situational analysis revealed the following issues:

a) Importers:

- Public Procurement and Property Administration Agency (Government importer for common user items): Unplanned purchase, unplanned delivery schedule, unknown lead time, and lack of integration with other stakeholders are the common problems identified in the situational analysis of Public Procurement Agency.

- Relief Cargo importers: Delivered in bulk, delivered with only one and the same port, unplanned truck allocation, traditional working system, and cause for port and road congestion are the major problems identified in the situational analysis of relief cargo owners.

- Commercial Importers: lack of proper shipping documents, lack of regulatory offices permit timely (bank, insurance, shipping or airlines, Ministry of Agriculture, standard), discrepancy between the actual goods and the presented shipping document by weight, quantity, package, and other matters are the frequent problems identified in the situational analysis of commercial exporters.

b) Exporters:

- Commercial Exporters and exports association: Lack of proper shipping documents, lack of regulatory offices permit timely (bank, insurance, shipping or airlines, Ministry of Agriculture, standard), discrepancy between the actual goods and the presented shipping document by weight, quantity, package, and other matters are the frequent problems identified in the situational analysis of commercial exporters.

- Project Exporters: Lack of proper shipping documents like invoice, packing list, the previous import declaration, lack of evidence for

transferred, or re-exported materials are some of the problems identified in project exporters' situational analysis.

c) Shipping Agents (other shipping lines and their agencies):

Sometimes consignee's name does not comply with customs way of coding; as customs coding is based on the documents the client presented or treated in the country, failure to put the correct name and address of consignee's organization on the bill of lading, discrepancy of package, container & seal number, and weight with the one mentioned in other shipping and commercial documents are the common problems identified in the situational analysis of shipping agents.

d) Freight Forwarders:

Currently there is not sufficient training and skilled manpower within the sector, lack of knowledge is the challenge of the sector, lack of working capital. The sector needs a huge working capital. Individual and institutional discipline is the challenge of the sector, communication with customs officer has to be more efficient.

e) Transporter and Transport Associations:

Trucks spent excess time at garage, insufficient knowledge in truck administration, traditional fleet system, topography of the country challenges the old trucks, lack of usage information of technology, lack of GPS usage, in this case negotiation is a bit difficult for transporters, the Transport Association has a lack of follow up / replacement of trucks and low capacity to enforce the transporters are the major prevailing problems in the transport sector of Ethiopia.

f) Ethiopian Airlines:

Serious problem in locating shipment in the warehouse, manually searching location of goods is making the search difficult, missing goods or goods lost, failure to assign fixed person in charge of dealing with claims in association with the lost items, warehouse space scarcity leads to shipments storage on open space and again causing damage due to rain and sunlight, are the major problems identified in the situational analysis of Ethiopian air cargo services. Principally interesting when the development of Debre Zeit Airport will move forward and cargo movements could be established.

2.1.1.5 Context Analysis

The PESTEL analysis method encompasses the political, economic, social, technological, environmental and legal aspects of a country. It identifies significant changes in the political, economic, social, and technological landscape and to assess the effect of these changes on the nation's logistics landscape and the implications for the Ethiopian logistics industry in the future. On top of this, it serves to explain the political and economic structure of Ethiopian government, which gives a base for interpreting future changes in the macro economic environment. The implications of each of the PESTEL components are discussed below.

2.1.1.5.1 Political

Since 1991, Ethiopia is an ethno-linguistic based federal democratic republic. The Ethiopian political environment is characterized by seemingly stable and dynamic, but fragile states. Many of the issues in state formation are incomplete and there is lack citizen consensus on many common issues. However, its huge population size, diversified demographics, and its endowment with natural resources kept the country intact and enable it to register fast economic growth and development.

Because of its large geographic space and population compared to other Horn and East African countries, its stability or disunity has a contagious effect on the neighboring countries. As a result, its political stability and transition to democracy will enable harmonization and regional integration with its neighboring Horn and East African countries.

The stable political environment in Ethiopia coupled with the political decision for economic integration with neighbouring countries (Sudan, South Sudan, Eritrea, Djibouti, Somalia, and Kenya) is the key and offers a big market opportunity for the Horn and East African community since Ethiopia has a population of over 100 million and the potential to become a middle income country by 2025. This economic growth would increase its population's purchasing power. Political decision can allow economic integration and market liberalization that in turn allows free movement of resources (goods, people, information, and finance). This further enables logistics development in terms of joint infrastructure investment and development (road, rail, port, pipeline), joint regulation (e.g. one stop border control for customs), and allowing logistics service providers to operate in all countries within the Horn and East African Community.

Ethiopia is working significantly on industrializing its economy that has so far relied heavily on agriculture. Major infrastructure projects have been carried out that will

catalyze trade and take the country on a new level of openness to attract foreign direct investment. Hence, this will trigger the Ethiopian government to work more to modernize its logistics services quality.

Similarly, the Ethiopian government is ensuring strong political commitment to modernizing the logistics sector. And the sector has been identified as one of the key areas of intervention under the Second Growth and Transformation Plan (GTP II). It has been recognized that the logistics sector is making strong contributions in several critical ways to improve the nation's economy: providing supporting services to the manufacturing and agricultural sectors, improving investment attraction/retention and for increasing the country's international trade performance by enhancing export competitiveness. The GOE is also introducing several reforms to meet the expectations of Ethiopians, which is one of the areas that is seeking the attention of policy makers and political leaders in the logistics sector.

Besides being a member of the Intergovernmental Authority on Development (IGAD), Ethiopia is playing a significant role in peacekeeping in the region. To ensure its development, the Ethiopian Government is taking different initiatives to create political stability in the East African Region and keeps working on stabilizing its regional relationships and maintaining a peaceful partnership among different countries in the region. As Ethiopia is located in the Horn of Africa, it is close to the Middle East and its markets. This factor serves to upscale the logistics industry and to open opportunities to ensure seamless supply chains to link the two regions and to increase the capacity for outreach to the Middle East.

Ethiopia is a diplomatic capital of Africa with United Nations Economic Commission for Africa (ECA), African Union (AU), and other international organizations. This offers an opportunity to Ethiopia to easily promote its resources in order to attract foreign direct investment and to establish strategic links with certain international organizations and further penetration of African trade relations.

2.1.1.5.2 Economic

Ethiopia's significant economic development (averaging 10.3% a year from 2005/06 to 2015/16 and anticipated growth of 8.5% up to 2020) boosts international and local trade that in turn increases the demand for highly integrated logistics services. GTP II focuses on boosting exports, increasing the industrial component of GDP from about 12 % to 22% and leading Ethiopia to become a middle-income country by 2025. As already stated, Ethiopia is one of the world's fastest growing economies and is projected to maintain sustainable growth in the medium term. Nevertheless, Ethiopia needs

economic reforms to sustain rapid growth and boost exports amid a severe hard currency shortage. Economic studies highlight, reform priorities to realize Ethiopia's industrial goals. As the country still stands at the beginning of structural transformation, tapping into the potential of the service sector, such as telecom, utilities and finance, this could help Ethiopia to reach its industrial goals.

2.1.1.5.3 Social

The population of Ethiopia is expected to grow to 140 million inhabitants by 2030. The population is growing with an average growth rate of about 2.5%. This will have an impact on the nation's economy in general and the importation and exportation sectors in particular, since the size of import and export volumes is associated with population growth. This again has its own relationship with port infrastructure development and additional logistics facilities.

2.1.1.5.4 Technological

Ethiopian information and communication technology infrastructure is not sufficient to modernize the logistics services, and more investment is needed in communications networks to allow all trade activities to be integrated and to ensure smooth flow of information and to manage country's logistics operations in a more integrated way. Ethiopia is one of the few African countries with a public monopoly on information and communication technology. The Ethiopian logistics industry may face limitations in applying advanced technologies to ensure end-to-end logistics services. Cognizant to this, one of the actions that the government is willing to take is privatizing some share of Ethiopian Telecom. This may allow the services to be improved. The implementation of an adequate system of communication and information technology will greatly contribute to integrating different actors in import and export supply chain. Legislation was drafted several years ago to give documents transmitted electronically the force of law. It is important to pass it into law to increase connectivity throughout the logistics structure.

To achieve the Sustainable Development Goals (SDG) and Istanbul Plan of Action (IPoA) ethio telecom has been running different expansion projects. And the telecom is working to achieve Connect 2020 Agenda of ITU (growth, inclusiveness, sustainability and innovation & partnership). All these different efforts will support to catalyze the Ethiopian trade logistics services.

Furthermore, logistics service competitiveness is enhanced by the level of logistics and technological infrastructure on the relay of information on customers order processing

and order delivery is made through Information Communication Technology. Though, currently ethio telecom is the sole telecom service provider in Ethiopia with its capacity to support logistics technological infrastructure affects logistics information and document flow, this monopoly company is part of the government's recent move to partly privatize the ethio telecom sector in Ethiopia allowing foreign investors to partly own telecom business in Ethiopia. This privatization of ethio telecom, coupled with World Bank supported electronic single window service for customs clearing with standard documents and procedures adopted by Customs Commission and the availability and adoption of Oracle ERP system by Ministry of Revenue ;and planned integration and adoption of ERP software by all Federal Government Institutions including Banks in Ethiopia, the adoption of customized Logistics Information System(LIS) by many private logistics service providers and ESLSE, will most probably make the information communication technological environment conducive for logistics service provision in Ethiopia.

2.1.1.5.5 Environmental

Ethiopia has been pledging to ensure sustainable economic growth and signed many agreements in relation to building a climate resilient green economy (CRGE). The development of decentralized urbanization and industrialization is encouraged in GTP II, for example building more industrial parks around the country. The effort to generate the fast growth of industrialization is planned to significantly contribute to GDP is also necessitated by the rapid rural urban migration and high youth unemployment in the country. The attraction of foreign direct investments to the industrial parks for fast industrialization is often in conflict with environmental sustainability as evidenced from some of the investments that attracted old generation technology from the parent company that brings environmental pollution. This is also true for the import of used freight logistics assets (mainly trucks) to Ethiopia for the import and-export logistics services as there is no policy that prohibits import of old vehicles to Ethiopia. Carbon emission from old vehicles will also contribute to environmental pollution of the country. To this end, ensuring green logistics practices in the nation is very much crucial to meeting the interest of different pressure groups and to go with the nation's green resilience economic strategic direction and to comply with various international standards to which Ethiopia has agreed to adhere.

2.1.1.5.6 Legal Environment

It has been obvious that one of the key shortcomings of the logistics sector is related to policy and regulatory barriers that excluded participation of international logistics service providers. However, recently the Ethiopian government has amended a major

regulation that restricts foreign investors from engaging in parts of Ethiopia's investment incentives and investment areas reserved for domestic investors by lifting the restriction on logistic industry which was exclusively reserved for Ethiopian nationals. Packaging, forwarding and shipping agency services were exclusively reserved for Ethiopian nationals. The government decision allows the international logistics service providers to hold up to 49% in logistics business.

Based on the directives issued from Ethiopian Investment Board on Ethiopian Logistics Services, Directive no: 2/2018 in August 2018, foreign investors are allowed to own shares in logistics industry of Ethiopia. This is related to two mandatory objectives: to expedite manufacturing industry growth, and to adequately increase export trade. The specific logistics activities which were previously protected for the local logistics companies, were allowed for international logistics companies up to 49% share in the form of the joint venture business model with Ethiopian business counterparts are: container handling, bonded warehouse administration, consolidation and deconsolidation services; and previously prohibited logistics services jobs for foreign investors like: stuffing, freight forwarding, shipping agent services.

This will foster logistics service competitiveness in Ethiopia that increases the demand for a value-added service expected at the Modjo Green Logistics Hub.

2.1.1.5.7 SWOT Analysis

The analysis in this section serves to identify strong features of the logistics services at Modjo, weaker aspects that require improvement, opportunities to be tapped and threats to be tackled. Moreover, the strengths and weaknesses from within, and the forthcoming opportunities and threats from outside need to be identified in order to assess their impact on the establishment of the MGLH.

a) Strengths

The Modjo Dry Port has many strong features as the major dry port in the nation. The strengths of the dry port are the basis for sustainability and future development.

MGLH is strategically located on the new railway network between Addis Ababa and Djibouti, as well as located in proximity to the main consumption centres. The strong market position of Modjo Dry Port can be best explained due to its strategic location along the Djibouti Corridor with intersections to the North and South. Moreover, future developments in the Port of Djibouti are expected to further strengthen this position. The Port of Berbera also provides an alternative opportunity to serve for future import and export cargo destined to or from Ethiopia, for which Modjo is also well located

along the Berbera Corridor. The same applies to the Port of Assab, which are able to handle cargo for Ethiopia on the medium-term after reintroducing the cargo flows via these corridors. ADD

The dry port has strong interest for improving working conditions in a modernized way. It has cooperative and responsible management and employment handling is also good. It saves foreign currency that could have been charged at Djibouti Port. The dry port prepares containers for checking. Both road and rail serve the Modjo Dry Port.

b) Weaknesses

ESLSE is a monopoly operator at Modjo. The lack of competition is likely to result in lower efficiency and higher logistics cost. Poor safety practices and little knowledge about IMDG procedures and firefighting techniques will expose the services to bear high cost. In addition to this, there is a problem of utilizing a limited number of containers properly because of the poor monitoring and tracking system. Inadequate fencing and other security for cargo and operation, limited IT use and limited interface within the various departments of the enterprise are the critical bottlenecks. All these weaknesses hamper efficient logistics and end to end services.

c) Opportunities

Ethiopia has shown continuous economic growth in recent years and this sustained economic growth has provided strong incentives to modernizing logistics operations and services. The commitment of the government in supporting the logistics sector is important to achieve nation's objectives. The great work done from Ethiopian Government side on railway transport enables ensured efficiency in handling bulk imports and better cargo security. The railway also provides an opportunity to develop bulk systems for moving goods into Ethiopia quickly and distribute from Modjo. Transferring cargo from road to rail has the potential impact of reducing fuel consumption and air pollution. This aggressive work serves to build networks. In deciding to use Modjo, a logistics company will compare the end to end logistics system with its current system. So, Modjo will enable provision of opportunities to the actors in the logistics industry. Efficiencies gained at Modjo and through greater attention to the whole logistics chain will foster export growth and import effectiveness .

d) Threats

The trade imbalance between import and export makes Ethiopia experience consistent trade deficits and this is because of small production of exportable items and logistics difficulties. Ethiopia is experiencing every now and then foreign currency crunch and

this is creating insufficiency of foreign exchange for matching import needs. Long delay in clearing imports is becoming a threat to the nation's logistics industry. This mainly happened due to importers using the dry port for storage until they find buyer for goods, and/or lacking of finance to pay duties to clear goods. In addition to the above issues the following elements are identified as threats for the logistics industry:

- Current storage penalties are too small to be a deterrent to leaving goods at Modjo Dry Port. This is a systemic problem that cannot be addressed by ESLSE alone.
- Congestion or inefficiency caused by extended storage of goods at Modjo
- Cost of empty return included in dry port fees, yet nevertheless return of empty containers to Djibouti are delayed. They congest the dry port and must add demurrage costs.
- Inability to provide empty containers to exporters efficiently
- Insufficient use of readily available terminal operating systems

Due to the liberalization of multimodal transport services to international operators, utilization of Modjo may be effected by the implementation of Andode Dry Port, if the rail freight terminal (5km from Addis Ababa on the way to Sebeta railway station), will be developed as a competitive logistics centre.

The following table summarizes the results of the SWOT analysis of context and market environment for the establishment of MGLH.

Table 3: Results of SWOT Analysis

Strengths	**Weaknesses**
• Modjo is the major dry port location in Ethiopia. It already handles 79% of all full import containers handled via dry ports. • About 44% of import containers through the Port of Djibouti are now cleared at Modjo Dry Port, which is strategically located about 58 km south of Addis Ababa District • Multimodal system and dry ports established to expedite import container handling and vehicles (< 3 tonnes). • Multimodal transport bill of lading enables more stuffing and stripping of containers in Ethiopia at dry ports. • Location of Modjo is central for delivery to most of Ethiopia. Systems developed at Modjo can be adapted other dry ports more directly serving the North and South. • Both road and rail serve the Modjo Dry Port • National transport and customs agreements coordinates cross-border movement to Modjo	• ESLSE is monopoly operator at Modjo - the lack of competition can lead to lower efficiency and higher costs. • Allowing private CFS operation in or near the dry port will not necessarily improve operations at Modjo dry port unless competition for logistics service is open. • Poor safety practices and little knowledge about IMDG procedures and firefighting techniques. • Access to containers (and other goods) isn't properly monitored at all times. Inadequate fencing and other security for cargo and operations. • Limited IT use. The dry port in-house applications called Container Tracking and Tracing System (CTTS) and Dry Port Information Operating System (DPIOS). DPIOS is an administrative application while CTTS does not support real-time information input and data is entered after the action is taken. There is also limited interface within the various departments of enterprise.
Opportunities	**Threats**
• Continuous economic growth in recent years • Geographic location positions Ethiopia for trade with Asia, Europe and Africa • Rail transport enables efficiency in handling bulk imports and better cargo security • Potential seaborne horticulture trade expansion if cool chain limitations can be solved • The railway provides an opportunity to develop bulk systems for moving goods into Ethiopia quickly. • Agriculture export trade can be strengthened by efficient dry port services such as consolidation, one stop regulatory controls and container stuffing of exports. • Strong GOE commitment to supporting the logistics sector as essential to achieving national objectives • In deciding whether to use Modjo, a logistics company will compare the end to end logistics system with his/her current system.	• Trade imbalance between imports and exports affects operations and costs • Insufficiency of foreign exchange for matching import needs • Railway spurs to port and land terminals have been slow to develop. • Insufficient reach stackers Rail Mounted Gantry crane not operating properly which delays rail offloading • Long delay in clearing imports – mainly due to importers using the dry port for storage until they find buyer for goods, lack of finance to pay duties to clear goods. • Storage penalties are too small to be a deterrent to leaving goods at Modjo. This is systemic problem that cannot be addressed by ESLSE alone. • Congestion or inefficiency caused by storage of goods at Modjo • Cost of empty return included in dry port fees, but delays in returning to Djibouti. They congest the dry port and must add demurrage costs. • In ability to provide empty containers to exporters efficiency • Insufficient use of readily available terminal operating systems Due to the liberalization of multimodal transport services to international operators, Modjo may not be the choice of the customers if Andode, the rail freight terminal (5km from Addis Ababa), will be developed as a competitive Logistics centre.

Source: HPC/CDC 2018

These results will be considered during the elaboration of the further sections.

2.1.2 Data Collection and Market Survey

In order to outline a clear map that could pave the way for the development of Modjo Dry Port into a modern and efficient Green Logistics Hub, a detailed work was made on the dry port to study its existing conditions. Hence, to address the claims made on the scope and the objectives of this consultancy work, the consultant team has used both secondary and primary data sources.

Secondary Data Sources: Detailed review has been made on the existing pertinent documents such as those listed below. Extensive use has also been made of other sources of data, statistics and studies from such resources as African Development Bank, World Bank, UNECA, etc.

Moreover, data has been gathered by five years of import and export statistics, Imported Container Report (2012-18)/EMAA, ESLSE statistics bulletin and strategic plan, EFFSA's bulletin, Investment Directive issued in August 2018, the African Statistical Yearbook 2018 and different demographic statistics.. To ensure credibility of the findings primary data were gathered to triangulate with the data obtained from the secondary sources. Cargo volume data has been received from Ethiopian Revenues and Customs Authority (ERCA; now ECC Ethiopian Customs Commission under the Ministry of Revenue) in Dec. 2018. The historic data used in the report are taken from data sheets provided by EMAA and the above mentioned reports, which have been elaborated 2014-2016.

Primary data were collected through observation and interviews: The consultant team has made structured observation at Modjo Dry Port site, and the extension area. It was recognized that site observation at Modjo Dry Port and the extension area served to inspect existing infrastructure and facilities and the development of the area. In addition to that the consultant team conducted more than 20 interviews during the period October 2018 – February 2019. The data collected served for the preparation of demand analysis, and will also be used for the master plan and the preliminary and detailed design elaboration. The data collected through observation served to triangulate the data obtained through secondary sources. The data obtained from different sources were analyzed qualitatively and quantitatively.

2.1.2.1 Review of Secondary Sources / Previous Studies

The following documents and previous studies have been provided by the Client or other stakeholders during the mobilization phase as well as during the site visits:

- A Strategy and Transformation Study for ESLSE, 2014/MTBS

- Development of a National Logistics Strategy for Ethiopia Vol. 1, 2014/Nathan Associates
- Development of a National Logistics Strategy for Ethiopia Vol. 2- Diagnostic Analysis of the Current Logistics System, 2014/Nathan Associates
- Growth and Transformation Plan II 2015/16 – 2019/20; 2016/National Planning Commission, GoE
- National Freight and Logistics Strategy for Ethiopia, 2016/EMAA
- The Expansion and Upgrading of Modjo Dry Port into a Logistics Hub Pre-Feasibility Study; 2016/ FLK Trading PLC, Customs, Tax, Management & Finance Consultant
- Environmental and Social Impact Assessment (ESIA) of a proposed Trade Logistics Hub at Modjo, 2016/EMAA

The an overview of the content as well as major findings of each report considered in the Demand Analysis are described in the following sub-sections.

2.1.2.1.1 A Strategy and Transformation Study for ESLSE

An overview of the content and aims of the study: In 2011, the Ethiopian Government merged three state owned logistics companies – namely Ethiopian Shipping Lines Share Company (ESLSC), the Maritime and Transit and Services Enterprise (MTSE) and the Dry Port Service Enterprise (DPSE) - and established the Ethiopian Shipping and Logistics Services Enterprise (ESLSE). These three companies were the principal Ethiopian service providers in the maritime and transit corridor sub-sector. It became imperative for ESLSE to assess the business environment, consolidate its services and to determine clear development strategies to achieve the objectives for which it is established. The overall corporate objective for ESLSE has been defined as transforming ESLSE into a world-class international logistics service provider which outperforms in competiveness, efficiency, reliability and profitability.

To reach this target, the Strategy and Transformation Study followed four steps, which were conducting a performance baseline analysis for ESLSE to determine the ‘as-is’-situation, conducting a best practice (benchmark) study to define the desired ‘to-be’-situation, performing a gap-analysis to identify the gaps that had to be bridged and defining a five years strategic and implementation plan. The aim was the elaboration of measurements to achieve the detailed and measurable targets, like increase of the volume of goods transported by Multimodal System from 2% to 80% for import and export, achieve port utilization ratio of 60% for Djibouti, 30% for Berbera and 10% for

Port Sudan and increase cargo handling capacity of Modjo and Semera Dry Ports to 100% as well as reduce import and export transit time from 30 days to 20 days.

Conclusions taken from this report for the demand analysis: This report was a suitable introduction for the team to work on the Modjo project before starting the on-site visits as well as the stakeholder involvement. All relevant technical terms and the role and mission of ESLSE are described. Beside common practise in logistics processes it gives a good insight on especially the specifics of Ethiopian logistics procedures. It could be stated from today's point of view that several challenges identified during the elaboration of the study in 2013/14 are still valid and unsolved. The analysis of the conducted commodity forecasts and the cross check why the forecasted volumes are differing from today's volumes did give the JV indication on parameters to be carefully used and assumed, as they have a remarkable impact on projected volumes.

2.1.2.1.2 Development of a National Logistics Strategy for Ethiopia Vol. 1 and Vol. 2

An overview of the content and aims of the study: The Diagnostic Analysis of the Current Logistics System uses value and supply chain analyses of six leading exports and five key imports to provide an analysis of logistics in service to specific commodities. It also analyzes the operation of Ethiopia's trade corridors and of each mode of transport to assess the needs for improvements. Road transport was the main mode at that time and in the midst of restructuring and modernization of fleets. The standard gauge railway was under construction and its integration in the network was reviewed. The ports were also evaluated for strengths and weaknesses. It discusses the common threads that lead to storage problems at the Djibouti port, Modjo Dry Port and the general air cargo terminal at Bole international airport. The report analysed the operation of the Ethiopian Commodity Exchange, which is heavily involved in the main export commodities, and the banking sector's role in trade. The Diagnostic Analysis also reviewed the logistics systems governing the import and export process, particularly the Ethio-Djibouti Corridor, as the main one being used, and the role of Modjo Dry Port in facilitating the flow of cargo traffic and in addressing the time and cost constraints to Ethiopia's trade. It has a comprehensive discussion of Ethiopian Customs and efforts to streamline its processing through emphasizing compliance incentives. The document also provides a thorough discussion of the legal and regulatory framework governing trade and logistics.

The second volume is the *Logistics Strategy Blueprint*. Ethiopia has set a goal of achieving middle income status by 2025. The Blueprint outlines the international corridor and gateway systems to achieve this through increased trade. It also

recommends logistics strategies for production networks, distribution networks and logistics services.

Conclusions taken from this report for the demand analysis: The Diagnostic Study recommends that to be effective, Modjo needs to address the excessive dwell time of cargo at the facility. It recommends better use of software applications to manage operations and document flows, implementing higher storage costs and seeking to change users' practices. It provides a thorough assessment of transport operations and cargo flows, much of which is still relevant in making Modjo a more effective node in the transport and trade systems on the Ethio-Djibouti Corridor. Ethiopia has constraints in foreign exchange and an elaborate system for maximizing its availability for trade. Understanding this banking system is important to addressing cargo storage issues at Modjo. The Blueprint provides strategies as part of an integrated systems approach that is useful in visualizing efforts to improve individual components as part of the whole initiative.

2.1.2.1.3 Growth and Transformation Plan II

An overview of the content and aims of the plan: The Growth and Transformation Plan II (GTP II) defines the governmental aims for a five year period –2015 – 2020. Besides the definition of aims and measures to be developed and implemented for the related period a comprehensive review of the GTP I – the previous Growth and Transformation Plan – is shown and therefore enables the reader to compare achievement of results with the originally planned ones. The main basis of GTP II is GoE's vision to become a lower middle-income country by the year of 2025. All further described targets are developed and implemented to reach this major aim.

Conclusions taken from this report for the demand analysis: The elaboration of the Demand Analysis takes place in the second half of the 'validity period' of the GTP II. Hence, it could be assessed to a certain extent, if the defined measures and aims will be reached or not and how the described measures to approach the defined aims have been implemented so far. Among others the finalization of the construction of the rail corridor between and Djibouti and Addis Ababa has been one of the major aims, which had been reached by 2017. A quite comprehensive retrospection of the GTP I also strengthens the understanding of JV's team for the governmental willingness towards and the practical implementation of trade supporting measurements. Mentioning the importance of the establishment of dry ports and their value for the improvement of the transport and logistics sectors does also indicate the political backing of the proposed developments at Modjo.

From page 171 on the GTP II defines specific major targets for the logistics sector. The related chapter is 5.1 Integrated Transport and Logistics Services. The reduction of *'transportation cost through creating an integrated system and increasing efficiency of transport services'* are defined as major targets as well as the enhancement of capacity to enable the private sector to provide transport services. This means in numbers:

- Reduction of transit time for import and export by 50%,
- Reduction of average waiting time at sea port from the current 40 days to 3 days,
- Increase of national general cargo coverage through multimodal transport from 35% to 90%,
- Increase of containerization of containerizable export cargo from 7% to 100%,
- Reduce carbon emission by 10%,
- Provide rail capacity to 7.5 million tonnes of cargo per annum by 2020.

These targets have been considered to a reasonable extent during elaboration of the cargo volume forecast.

The governmental willingness specifically regarding development of dry port is expressed in section 5.5 Maritime Transport Services, where it is stated that 'It is also planned to enable all import and export goods be transported through multimodal transport system and to improve dry ports freight handling and administration capacity. During the GTP II period, it is planned to conduct activities to modernize the railway and road transport subsectors.

2.1.2.1.4 National Freight and Logistics Strategy for Ethiopia

An overview of the content and aims of the study: As the Federal Democratic Republic of Ethiopia aims to become a middle income country by 2025, an increase in export, but also import is regarded as key to get there. However, the current logistics performance suffers from a number of weaknesses, which are likely to constrain Ethiopia's trade performance. To assess the current status of logistics performance and to draw up a strategy, in 2015, the Ministry of Transport and Ethiopian Maritime Affairs Authority prepared the National Freight and Logistics Strategy (NFLS). The NFLS analysed the logistics performance of the country, provides a diagnosis of main weaknesses and constraints of logistics performance and to sets out a vision, mission and strategic objectives for the development of the logistics system of Ethiopia.

The NFLS analysed bank processes, shipping, and port operations, freight transportation, inland dry ports, customs process performance for both import and export trade and identified major issues and their root causes. Moreover, the NFLS reviewed results of the Logistics Performance Index of the World Bank "Connecting to Compete" Report, results of the "Vienna Program of Action" of the UN-OHRLLS and results of the Global Competitiveness Indicators of the World Economic Forum "Global Competitiveness Report". In addition, the NFLS made up a demand forecast for import and export trade until the year 2025 and derived major consequences for the freight transport system.

The demand for freight transportation services is expected to increase over the coming 10 years; imports are expected to increase by 60 percent and exports by 40 percent until 2020. Similar growth figures are expected between 2020 and 2025. The NFLS concludes that with the current capacity and performance levels, the logistics system will not be able to allow the various growth drivers to fully unfold their effects and to translate adequately into economic development.

Conclusions taken from this report for the demand analysis: Based on the preceding analysis, demand forecast and economic development objectives of Ethiopia, the NFLS states that the national vision is to "Transform Ethiopia's logistics to a level of global best practices (…)"; the mission of the logistics industry is "Contributing to the efficient flow of goods, information and transaction (…) to support Ethiopia's competitive advantage (…) ensuring that goods & services are available to citizens at lower logistics costs" (NFLS, page 88).

The NFLS put forward six major strategic objectives in order to achieve the vision and mission, namely, (1) to strengthen the institutional capacity and policy support, (2) to improve trade finance and the trade system, (3) to develop the logistics facilities and infrastructure, (4) to establish an efficient transit and trade facilitation system, (5) to develop an efficient export logistics system and production network and (6) to develop a more efficient distribution network. Against the background of the present demand study for Modjo Green Logistic Hub, it seems important to point out that the NFLS regards dry ports as an important means to put the strategic objectives into practice.

As the cargo transport processes for different commodities are described in detail in the NFLS it has been a good source for cross checking data received and elaborated during the market survey. Current transit durations, dwell times, waiting times etc. have been validated always by comparing it to the 2015 figures. Also, potentially interesting commodities to be handled at a logistics hub are mentioned and what range of services could be requested from the market.

2.1.2.1.5 The Expansion and Upgrading of Modjo Dry Port into a Logistics Hub Pre-Feasibility Study

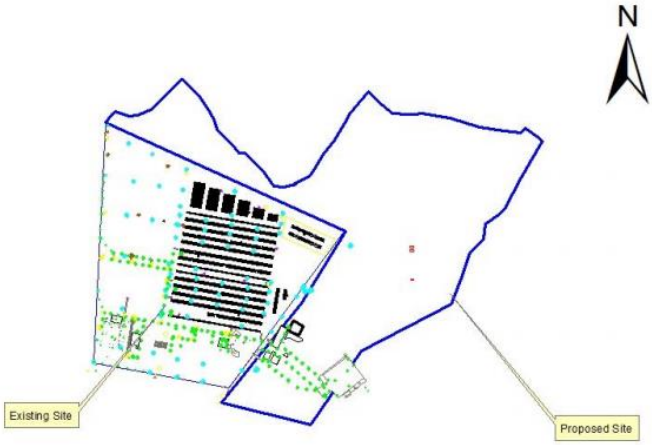
An overview of the content and aims of the study: This pre-feasibility study has been elaborated in 2016 by FLK Trading PLC, Customs, Tax, Management & Finance Consultant. The pre-feasibility study used primary and secondary data from relevant government organizations like Modjo Dry Port, ESLSE, ERCA (today Ministry of Revenue, Ethiopian Customs Commission) and similar organization concerning the port services as well as port facilities and equipment. Field visits were conducted and reports were reviewed to assess and analyse the physical environment and the location setup of Modjo Dry Port. An analysis regarding the existing capacity of the Dry Port service and future expansion and upgrading requirements have been made by forecasting the volume of trade over ten years.

Conclusions taken from this report for the demand analysis: The report has been mainly used to cross check gathered historical data for the demand analysis at hand. As the forecast of the pre-feasibility study is very static (e.g. constant growth rates over ten years) the future volumes have not been considered as a benchmark for the following Modjo volume projection of this study.

2.1.2.1.6 Environmental and Social Impact Assessment (ESIA) of a proposed Trade Logistics Hub at Modjo

An overview of the content and aims of the study: In order to enhance the performance of the Ethiopian-Djibouti corridor, it has been decided in 2015 to improve the operational capacity, efficiency and range of logistics services at the Modjo Dry Port. The ESIA is related to the measurement to enlarge the site from current 62 ha by a further 87 ha (see Figure below). Hence, it does not consider the total now available 120 ha.

Figure 7: Proposed Extension Area considered in EISA 2016



Source: Study: Environmental and Social Impact Assessment (ESIA) of a proposed Trade Logistics Hub at Modjo

For this extension, this ESIA at hand has been prepared and finalized in 2016, which has been studied carefully by the Environmental and Social Specialists.

The ESIA provides relevant information such as results of public participation and stakeholder consultations and meetings, impact identification and evaluation, as well as Environmental and Social Management Plans (ESMPs) for the construction period and for operation. The ESIA follows the World Bank's Operational Procedures (OP) and Best Practices (BP):

- OP/BP 4.01 on Environmental Assessment
- OP/BP 4.11 on Physical and Cultural Resources, and
- OP/BP 4.12 on Involuntary Resettlement.

In addition to a number of positive environmental and socio-economic impacts, such as

- Reduction of traffic congestion by increased railway transport,
- Reduction of CO_2 and other air emissions, and
- Employment opportunities.

the ESIA has identified resettlement as the key negative socio-economic impact. Construction and expansion of the dry port required the relocation of several households and farms. According to the study of 105 Project Affected Households (PAHs), 58 households were displaced already during the initial land acquisition in 2007; further 47 households lost their farm and grazing lands during land acquisition in the run of the expansion plan of the Modjo Dry Port Facility in 2015.

Therefore, a Livelihood Restoration and Rehabilitation Plan[4] has been drawn up to ensure the restoration and improvement of incomes and livelihoods of the affected households. The plan has been finalized in May 2018 and is presently reviewed by the Social Expert.

Conclusions taken from this report for the demand analysis: The 2016 ESIA forms a solid base to be worked on for the present "Abbreviated ESIA (AESIA)" which is intended to cover the last step of Modjo Dry Port Expansion and its operations.

Based on the findings of the 2016 ESIA, the Environmental Experts have conducted a site inspection with the objective to verify these findings and to highlight further topics to be dealt with in the AESIA which have not been covered in-depth in the ESIA, due to a lack of information at the time. These topics include operational issues, among others:

- Handling and storage of dangerous cargo (IMDG Cargo);
- Work safety, occupational health;
- Soil pollution due to substantial oil spillages in workshop areas; and
- Waste water treatment.

According to recent planning, the latest step of extension will include an additional 30 hectares of land directly adjacent to the present railway station, consisting of hilly grass land with some trees. This area is currently inhabited and used by 5-6 farming households which will need to be relocated. In order to keep any socio-economic impacts as low as possible, a relocation plan will be drawn up based on experiences as described in the ESIA and in the Livelihood Restoration Plan.

[4] Livelihood Restoration and Rehabilitation Plan for Persons Affected in 2015 by Modjo Dry Port Expansion, ETLP, May 2018

2.1.2.2 Market Survey

The conducted site mission for identification of cargo volumes, process mapping, potentially requested services, and required additional infrastructure included

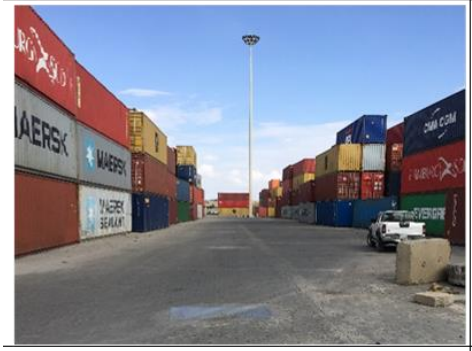
- discussion of commodity handling, current cargo flows and expectations towards a MGLH with logistics sector stakeholders
- discussion with Client EMAA on conditions for developing a MGLH
- comprehensive site visit and inspection of the Modjo site and extension area
- collection of the information required for the preparation of the demand analysis and, master plan and the preliminary and detailed design,
- conduct of more than 20 interviews with relevant stakeholders and potential customers of MGLH, and
- meeting with Consultant's local team on data collection and market survey.

An initial site visit was conducted by the Consultant on the 12th October 2018, following the kick off meeting. The second site visit took place on the 6th, 7th and the 8th of November 2018, in Addis Ababa and Modjo. The program of the visit was as follows:

- 06.11.1018:
  - Meeting with EMAA's team to discuss activities for civil engineering and their objectives and prepare the site visit;
  - Meeting at Ethiopian Shipping and Logistic Services Enterprise (ESLSE) to discuss Consultant's activities, collect information required for the preparation of the master plan and to prepare for the site visit;
  - Meeting with Consultant's local team on data collection, topographical and geotechnical issues etc.
- 07.11.1018:
  - Site visit at Modjo Dry Port to inspect existing infrastructure and development area.
- 08.11.1018:
  - Second site visit which allowed a further inspection of the existing infrastructure and facilities;
  - Meeting at Construction Design S.Co to collect as-built documentation;
  - Meeting at ESLSE to collect additional information.

The visit to the development site and the existing facilities was an important task in order to gain deep insight into the local conditions, become more familiar with the area and gather information related to the main technical features of the existing infrastructure. The site visit included a visual inspection of existing facilities in the project area and its boundaries related to the civil infrastructure. This will allow the Consultant to compare and align findings from data collection with the actual situation on site.

Figure 8: Impressions of the Site Visits



Container yard

Ground water tank

Railyard

Warehouse

Workshop under construction

Development area

Source: Sellhorn 2018

Main activities carried out during the site visit were:

- Collection of data and information related to existing and planned infrastructure:
  - Potable water and firefighting water supply
  - Rain water drainage
  - Sewage
  - Roads and terminal pavement
  - Power supply
  - IT and communication systems
  - Railway connection
- Collection of information regarding needs and requirements for utility supply.
- Become familiar with existing infrastructure.

The following data was collected by the Consultant (refer also to the Register of Exiting Documents Available in Annex 1):

- Existing development/master plans
- As-built drawings
- Bills of quantities
- Design reports
- Geotechnical data, soil investigation results

The description and assessment of the existing infrastructures and the findings of the site mission for infrastructure and civil works will be part of the Component Report 2.

A third on-site visit took place during 12th to 16th November 2018. The whole week consisted of meetings and discussions with relevant stakeholders and potential customers to enhance collected primary data with statements, assessments and opinions of logistics and trade related companies, associations and experts. The following schedule has been elaborated with strong support by EMAA:

- 12.11.2018; 09:30 h: Meeting with Project Director to EMAA for agree on week's schedule and the way interviews should be performed

- 12.11.2018; 10:15 h: Meeting with ESLSE, Port & Terminal Section
  - Slight decrease of container volumes expected in 2018
  - Truck transport represents a high share of modal split
  - Limitations by conditions of certain roads and bridges
  - Number of exporters in the direct vicinity of Modjo low

- A Suitable catchment are for a logistics hub might be 100 km
- Currently only limited space for customs available at Modjo
- Container stored longer than 60 should be moved to a 'Auction Container Depot'
- Consider handling of dangerous goods
- Reefer plugs are currently installed at Modjo
- Silos should be included in a new logistics hub
- Bagging of grain and fertilizer in Djibouti is done/organized by ESLSE as Djibouti Port Authority has closed its bagging facility

- 12.11.2018; 11:30 h: Meeting with ESLSE, Freight Forwarding/Multimodal Ops. Dept.
  - 79% of containers are transported by multimodal system to Modjo
  - Shipping lines are requesting empty container re-location
  - Conduct of container movements by ESLSE
  - Coffee storage should be included in logistics hub
  - Main objective of Modjo Green Logistics Hub is to involve private operators as the sector is requesting it since a while

- 12.11.2018; 01:30 h: Meeting at ERCA (now ECC), Customs Procedures & Support Directorate
  - Customs will expend resources at Modjo if required
  - The AEO programme currently consists of 50 members (authorized economic operator)
  - Knows about truckers complaining regarding less availability of fork lifts at customs stations
  - Single window operations is the final aim of optimal procedures

- 12.11.2018; 16:30 h: Ethio-Djibouti Railway S.C.
  - 83% of transport is cargo; 17% are passengers
  - EDR is responsible for rail operations and track maintenance (not construction)
  - 2 trains are operating currently
  - 53 rail cars per train; 106 TEU
  - Fertilizer and cement cover around 30% of cargo volume
  - ESLSE is major client
  - EDR maximum annual transport capacity is about 6 mil tonnes
  - 25,000 TEU annual capacity

- 13.11.2018; 09:30 h: Meeting with Ethiopian Agricultural Business Corporation
  - Modjo is assessed as a suitable location for handling fertilizer imports
  - Fertilizer imports are steadily increasing
  - Education of farmers would improve the use of fertilizer
  - Currently available facilities have a standard of ’10 years ago’
  - 100,000 tonnes of storage capacity seems sufficient in Modjo
  - Currently some are transported to Adama/Nazareth in bags for further distribution
  - Storage in bulk is better than in bagged condition
  - Currently only bagged fertilizer is transport as no bagging facilities are available outside Djibouti
  - March-July peak season for fertilizer distribution

- 13.11.2018; 11:00 h: Meeting with Freight International (PABOMI)
  - It takes currently 3-5 working days to get a container out of Djibouti port
  - The use of reach stackers generates high axle loads which are bad for pavement conditions.
  - Operations without reach stackers would remarkably minimize ops cost
  - Bulk facilities should be close to a separate rail yard

- 13.11.2018; 02:00 h: Meeting with two associations which have been ELCoP Ethiopian Logistics Community of Practice and Truck Association at EMAA
  - Modjo Green Logistics Hub should provide contribution to the local community
  - All required services for truckers should be provided (shopping, filling station, washing room, parking, accommodation etc.)
  - Facilities for bulk should be provided
  - Market compliant lease rates
  - Cool chain facilities for up to 600 tonnes per day should be provided
  - Pre-built facilities would be attractive
  - Competition with Andode expected
  - Opportunities seen by planned new international airport at Debre Zeit
  - The Logistics Hub should be a multi-user facility

- 14.11.2018; 09:30 h: Meeting with Ethiopian Horticulture Producer Exporter Association
  - Out of the 114 active members 85 are exporters (mainly flowers)
  - Supply chain and related facilities for flower export are already established at Bole Airport

- Tomato and onion producers are located in the Modjo area
- Logistics hub interesting for investors
- Due to high logistics cost e.g. bananas are sold regionally
- Services like cold storage, crops washing, packaging, waxing, fumigation are required
- Availability of reefer containers important

- 14.11.2018; 11:00 h: Meeting with Ministry of Agriculture, Agricultural Input and Output Marketing Director
  - Major challenge for import and export is availability of suitable facilities in the sea port
  - Major goal: Delivery of cargo to customer on time.
  - Procurement cost for e.g. fertilizer include transport, administration, insurance, small margin (procurement cost per tonne = 300 USD; selling price to customer 40 USD per 100 kg)
  - Truck services are tendered per fertilizer order
  - In 2017 around 30,000 tonnes of bagged fertilizer distributed within two months

- 14.11.2018; 02:00 h: Meeting with Ethiopian Trade Business Corporation
  - Involved in not only grain, but also exports of coffee, pulses, beans, sesame and fruit and imports of consumer goods. Have a two way traffic to rural communities
  - Importing around 600,000 - 800,000 tonnes of wheat annually
  - Exporting 90,000 tonnes of coffee annually
  - A logistics hub should provide the stuffing of export containers
  - Location of Modjo is preferable to the location of Kality
  - Have a bonded warehouse and export and stuffing service, cleaning and packaging
  - Would be interested in having container cleaning and stuffing service at Modjo
  - Have been discussing bulk movement of grain to Modjo – would also use Kombolcha and Mekele for the north
  - Silos at Djibouti are too small

- 14.11.2018; 15:30 h: Meeting with CLS Logistics
  - Very interested in the ICD – had done a study of it earlier
  - Industry would use storage there if available
  - Container stuffing for coffee exports would be used

- Trade practices need to be reconsidered or number of delays and uncertainties
- Interesting if trade could be ex-farm or ex-factory…

- 14.11.2018; 15:30 h: Meeting with Alemya
  - Producer of strawberries
  - 80% for export; mainly Gulf Region
  - Chemical free growing
  - Ethiopia has very good preconditions for producing good crops (32 different climate zones) but transport cost often hamper trade
  - Challenges are availability of reefers, stuffing of containers in Djibouti (as the exporter has less control of the process in the port, far away from production site), bad road conditions
  - Rail-based transport solution would be highly appreciated
  - Logistics Hub should provide export consolidation facilities

- 15.11.2018; 11:00 h: Meeting with Ethiopian Coffee Exporters Association
  - Currently the washing of harvested coffee beans is done at the farms
  - Interested in the use of 20' containers
  - Challenge of the current transport chain is waiting time of an empty container available at Djibouti
  - Coffee is bagged in 60 kg bags and then stuffed in a container
  - Improvement of transit time / transport time in total is the most important objective
  - The variety of coffee is increasing.

- 15.11.2018; 01:00 h: Meeting with Ethiopian Leather Industries Association
  - Logistics Hub in general interesting for the association
  - The sector is very export orientated
  - Modjo is used for imports (needed components for production) currently
  - Major required services: provision of empty containers, security (high value goods), bonded area
  - Currently containers are stuffed at production site.

- 16.11.2018; 08:00 h: Full-day site visit of Modjo Dry Port and expansion area
  - The full day has been used to investigate the procedures and process related to cargo/ container handling.
  - The facility has been investigated regarding operational issues and aspects in detail.

- A summarizing meeting at the end of the day with terminal management was conducted. Further information was gathered:
- Currently 500 full-time employees and 450 temporary staff working in the dry port
- Currently no night operations at the rail as no lighting is available
- Trains are served by reach stackers; available RMG is currently out of order
- Truck gate is closed from 10:00 p.m. to 06:00 a.m.
- During the night shift mainly 'housekeeping' (shifting and relocating of containers) is conducted during the night shift
- Three (customs) categories of container: red = un-stuffing and physical check of cargo; yellow = check of documents only; green = no customs check
- Dwell time per container currently around 60 days
- Nine reach stackers currently at
- Modjo are available

The Trade Facilitation Expert conducted a fourth site-visit from 12 – 19 December to supplement information gathered in the first team visit. This version reflects further refinements and incorporates responses to comments by the client on the December submission.

- 14.12.2018:

  10:00 h: Meeting with Ethiopian Revenue & Customs Authority (ERCA; now ECC)

  - Meet with ASYCUDA office to obtain commodity data
  - AEO companies allowed to go directly to premises without container being put in the stacks
  - Lack of money to pay one of the reasons for long dwell time – are able to pay in installments
  - Customs clears sensitive goods in warehouse
  - Clearance for train at Dewale is manual
  - For horticultural product SAD used by both countries

- 17.12.2018:

  10:00 h: Meeting with Ethiopian Coffee Exporters Association

  - Export permit from the bank

- Grade and quality assessment done by Coffee Liquorization Unit
- Change – 80% of coffee exporters containerize in Addis Ababa
- Increasing theft of coffee in transit or in the port
- Theft of bags from truck and from drilling a hole in container
- Recommendation of coffee and sesame expert

15:00 h: Meeting with Ministry of Agriculture

- Modjo is best location for delivering in central and southern region
- EABC tenders and manages contracts with transporters
- Offloading at warehouses may be difficult because local transporter has just collected for distribution
- Warehouses rely on local laborers to offload. May not be available

- 18.12.2018:

  10:00 h: Meeting with Ethio-Djibouti Railway S.C.

  - Contract with trucking company to haul bulk grain or fertilizer from DMP to the terminal at Negad
  - Have capacity to haul as bulk
  - Crossing the border on rail is 40 minutes at Dewale
  - Andode operates for the unimodal system
  - Freight yard at Sebeta, which is 8 km from Andode
  - Most containers are 20s – 20 tonnes
  - Have refrigerated wagons for perishable goods in packages
  - Can also carry a refrigerated container on a flat car
  - Railway circulation to Modjo is 6 days

  12:00 h: Meeting with Ethiopian Horticulture Producer Exporters Association (EHPEA)

  - Trying to pursue cool chain
  - 40’ reefer container to Dubai or Jeddah is US$7,500 – 7,800
  - Cool chain requirement is below 10 degrees, varies by commodity
  - Modjo area offers a lot of horticulture opportunities (fruit and vegetables)
  - Challenge is the cost of bringing a reefer inland with only an outbound load
  - Meat also offers cool chain opportunities
  - Even if not active in horticulture now, will develop it if there is an opportunity

14:30 h: Meeting with Jittu Horticulture

- For fruit and vegetables – need niche products that can pay for air freight
- For Middle East market, need local partner who has market contacts and knows logistics
- Qualify for Fair Trade and Global Gap certification to give market advantage
- Ministry of Agriculture has several programs to help small holders start in horticulture

- 19.12.2018:

  11:00 h: Meeting with World Food Program

  - Two flatbed silos with conveyor belts are used at DMP
  - No demurrage, but ship charges include a delay fee built in
  - Ethiopian roads are in good condition
  - At Galafi, border posts are 4-7 kms apart
  - World Food Program uses Berbera Port
  - DP World is developing Berbera

  14:00 h: Meeting with Yhaenu Pvt. Ltd. Co

  - Presentations have been made to sesame exporters before
  - Exporters buy from ECX, clean and bag for transit to port
  - Mostly use Djibouti. Some pilferage, but Port Sudan is much worse
  - Interested to use rail, less loss in the system
  - In containerizing, some sesame is lost and container may not be clean
  - Export throughout the year

- 11.02.2019:

  09:00 h: Meeting with Moplaco Trading P.L.C.

  - Load containers on own trucks for transport to Djibouti
  - Load according to buyer specifications, including use of pallets, kraft paper and/or plastic membrane for wrapping. Modjo must have constant supply of these items and other required by buyer for containerizing.
  - Need shipping line to guarantee that containers are loaded on the ship
  - Need confirmation loaded on ship, to obtain customs clearance form to obtain foreign exchange and pay Djiboutian partner. Customs can take as much as a year to issue.

- Payment for Djiboutian portion about USD400 – 500 per container, including everything – fees, pallets, kraft paper, port dues, etc.

11:00 h: Meeting with Ethiopian Agricultural Business Corporation

- Obtained trucking fees for 2018-2019
- ESLSE handles fertilizer at the port
- $15 per tonnes for bagging – cost is paid by the supplier
- Terms are CFR – Liner Out, which means that the supplier covers all port costs including ship delays at port

15:00 h: Ethio-Djibouti Railway S.C.

- Confirmed 2 Container Trains and 2 bulk trains per day
- Explained my estimates for bulk movements, obtained rates agreed with EABC for fertilizer movement Djibouti to Modjo
- Phase 1 with existing rolling stock – 2 trains per day moving 5190 tonnes
- Agreed rates for coffee and sesame
- Rates are quoted in USD per ton/km, but can be paid in Birr per ton/km

- 12.02.2019:

  09:00 h: Ethiopian Grain Trading Enterprise

  - Also purchase grain Liner Out, so the supplier handles port and bagging
  - After loading in the overseas port, supplier sends documents so Commercial Bank of Ethiopia authorize preclearance at the port.
  - Off loading can be 5,000 per day, but fertilizer, wheat, sugar and coal can all arrive at the same time causing delays, particularly in the April to June period
  - There will need to be a disposal area at Modjo for grain that does not meet food quality standards
  - Agreed to provide shipment data for the previous 6 months, which has been put in the Demand Analysis Report
  - Tender for road transport services, contract with the lowest bidder
  - Also export coffee, sesame, pulses, etc. Therefore have some two way hauls

  14:00 h: Coffee Liquoring Unit (CLU)

  - All coffee must be tested for quality and graded by CLU before exporting
  - Coffee warehouses and regulatory agencies such as CLU and Customs are all located in the Jacos area of Addis Ababa

- CLU collect coffee samples for each shipment from the warehouses and bring them to the laboratory for testing and preparing the certifications, which are then returned to the exporters.
- CLU is concerned with coffee coming from ECX and directly from the farm for export. They think the direct sale offering full traceability and special packaging should be encouraged.
- Recommended discussion with the Coffee Authority for more information and their encouragement of value-added exports

16:30 h: ESLSE

- Steel is cheap to store at Djibouti and expensive to lift and transport. Steel and large, heavy equipment can readily be damaged in transport. Nevertheless, Ethiopia prefers to move it inland to Modjo or other dry port.
- Modjo will grow initially but then reduce volumes as other dry ports are opened.
- Dry Ports are intended to service the industrial parks being established in key urban centers.
- Dry Ports are being established and expanded according to a master plan developed by ESLSE.

More than 30 expert interviews were conducted during elaboration of this report.

2.1.3 International Benchmarking of Logistics Hubs

In this chapter, international examples and best practices of logistics operation areas, better said, a combination of dry ports and industrial parks to be called logistics hubs, are introduced. Ethiopian Shipping and Logistics Services Enterprise (ESLSE) said efforts are underway to develop dry new ports along with industrial parks and development corridors to facilitate import and exports[5].

The first dry ports have been established during the 1970s. The basic concept of a dry port is not new. Nonetheless, over the decades, various dry ports have been established and adapted to the market needs. This chapter will review a selection of established dry ports in a number of countries. The Modjo Dry Port will be compared with the Cikarang Dry Port in Jakarta/Indonesia, the City Deep Dry Port in Johannesburg/South Africa and

[5] https://allafrica.com/stories/201803150571.html

the Masaka Inland Container Depot in Kigali/Rwanda. Albeit established at different times, these three dry ports have a number of characteristics in common. The dry ports will be reviewed, as requested, in seven regards, namely (1) target demand, (2) physical conditions, (3) location considerations, (4) support infrastructure, (5) business model, (6) complementary services and (7) private and public participants. Based thereon, key findings of these dry port development projects, which may provide insight and value to the Modjo Dry Port Extension Project, will be extracted. The main characteristics of each dry port are shown in the following table.

2.1.3.1 City Deep Dry Port, South Africa

One of the first generation dry ports is "City Deep" in the south of Johannesburg, South Africa. It is shown on the figure below.

Figure 9: City Deep Dry Port Area

Source: Based on Google Earth

In 1977, the City Deep Dry Port was developed by South African Railway Services as an integral part of the rail network of South Africa. The dry port is now operated by Transnet Freight Rail, the rail freight division of the country's public transport operator.[6] The transport and manufacturing system of South Africa is regarded as one of the most established and developed on the continent.

[6] Cronje, Erené; Matthee, Marianne; Krugell (2009), Waldo: the Role of Dry Ports in South Africa; in United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) (2009), Transport and Communications Bulletin for Asia and the Pacific, No. 78, p. 115

The country is a major producer and exporter of agricultural products and hosts various manufacturing industries, including vehicle production and consumer electronics, at various locations, especially in the interior Gauteng Province, and at the country's major seaport locations.

One of the major strengths of the City Deep Dry Port is its location at the main economic centre of the country – more than 600 km away from waterways – along the North-South Corridor. The dry port is well located to serve the local and regional markets in South Africa as well as cross-border corridor markets further north and to neighbouring Mozambique via the Maputo Corridor.

Recently, a new terminal operating system was implemented at the City Deep Dry Port. The new system now provides integration between seaport terminals and the dry port software applications. This is regarded as a major improvement in terms of operations and visibility for the customer.

The City Deep Dry Port was built at a time when rail transport was the major and preferred modal option for port hinterland, domestic and cross-border transport. Road transport was regulated at this time. This all changed when road transport was deregulated. Nevertheless, the City Deep Dry Port is subject to a number of weaknesses, according to various reports.

First, during the last two decades, much of the growth in transport volumes in South Africa has been absorbed by road transport. Rail transport volumes stagnated or even declined (depending on the type of freight). However, the City Deep Dry Port was primarily designed to handle rail freight. Whilst road transport in South Africa gained in performance and importance in South Africa, rail transport lost in both regards. The road infrastructure of City Deep does not cope anymore with the high number of trucks entering and exiting the dry port. In addition, it was reported that cargo that has been selected for physical inspection at the Port of Durban is rerouted to the City Deep Dry Port for physical inspection.[7] To extend the capacity of City Deep, a new terminal, the "Tambo Springs Intermodal Terminal" is planned and expected to start operations in 2019 as part of a program to develop several inland container depots to help alleviate port congestion and facilitate distribution in the country.

[7] Bergqvist, Rickard; Wilmsmeier, Gordon (2013) Dry Ports – A Global Perspective: Challenges and Developments in Serving Hinterlands

Second, whilst the railway leg from the Port of Durban to the City Deep Dry Port is electrified, the dry port is not and depends on diesel traction units. This requires changes in equipment and crews and causes additional time and costs.

Third, rail transport and the dry port suffered from a high rate of theft of freight in transit. This issue has been addressed, however, by improving security around the dry port. During the last major upgrade, the City Deep Dry Port installed CCTV equipment. The new terminal operating system also makes its contribution by allowing customers to track and trace their shipment.

Fourth, the handled volumes by the dry port suffer from deficiencies in cross-border transport, such as lengthy border crossing procedures, resulting from a necessary change in traction units and crew changes. The railway is not able to play at its strength with regard to long distant transport.

2.1.3.2 Cikarang Dry Port and Industrial Park, Indonesia

As both Djibouti and Modjo need be part of an integrated hub and spoke system in order to minimize logistics costs and increase efficiency of logistics operations , in this system Djibouti should be only responsible for loading and unloading of the ocean vessel whereas Modjo is responsible for container storage, supporting services and facilities, and any export import formalities needed. An international example for this procedure is Cikarang Dry Port (CDP) in association with the Cikarang industrial park. Cikarang Dry Port in Cikarang in West Java is one of the “second generation” dry ports that place high value on greater participation of the private sector and a higher integration of logistics processes and the supply chain in Indonesia. The plot is shown on the following figure.

Figure 10: Cikarang Dry Port Area

Source: Based on Google Earth

The dry port was built in 2011 and is operated by PT Cikarang Inland Port, a subsidiary of the publicly listed PT Jababeka Tbk (at the Indonesian stock exchange). The objective of the Cikarang Dry Port is to reduce the load on the Port of Panjung Priok and, thereby, to reduce the dwell time of cargo.

CDP is surrounded by 13 big industrial estates in a suburb of Jakarta in West Java province. It comprises more than 4,000 manufacturing companies and occupies 200 hectares of land with direct access to highway and railway system. It developed and operates the facilities with capacity of 400,000 TEUs annually, and intends to continue to develop in line with increasing demand. CDP is the first and only Integrated Customs Service Zone (Kawasan Pelayanan Pabean Terpadu - KPPT) in Indonesia, enabling customs services and clearances to be done and completed there. Quarantine services like animal quarantine (life stock also requested in Modjo/Ethiopia), plant quarantine, and fish quarantine are also available and integrated in CDP.

One of the major strengths of the Cikarang Dry Port is its positioning as a seamless extension of the Panjung Priok. After vessel discharging or prior to vessel charging, cargo is directly transferred between the Port of Panjung Priok and the Cikarang Dry Port. By means of a multimodal bill of lading, a number of shipping lines offer direct services to Cikarang Dry Port.

The dry port operator states that the dry port is well connected to the port operator of the Panjung Priok Port; this includes the Indonesia National Single Window (INSW) where all document formalities related to the seaport, dry port, customs and quarantine can be done.

The dry port provides all the relevant infrastructure, facilities and services. These include a container yard including reefer plugs, a container freight station, warehouses including cool and bonded storage, customs inspection including x-ray scanners and final clearance. The Cikarang Industrial Park is just 18km away from the dry port and offers pre-built warehouses.

The dry port emphasises that each container is tagged with an RFID tag, which allows permanent identification of the container location.

2.1.3.3 Masaka Inland Container Depot, Rwanda

One of the latest dry port development projects is the Masaka Inland Container Depot in landlocked Rwanda, as shown in the figure below.

Figure11: Masaka Inland Container Depot Area

Source: Based on Google Earth

The dry port is constructed by a major international transport terminal operator, DP World, and expected to start operations at the beginning of 2019.

The dry port is located outside the city of Kigali; this location is expected to limit the effects of the dry port traffic volume on the overall traffic volume of the city of Kigali. With is location next to the capital Kigali, its road and (planned) rail transport corridors to Mombasa and Dar es Salam, and its transport corridors to neighbouring landlocked countries, the dry port is expected to serve the local market of the capital region, the domestic market of Rwanda, the corridor markets in Uganda, DR Congo, Tanzania and Burundi and overseas export markets. The Masaka Inland Container Depot will serve as single and primary dry port of the country.

At the moment, the Kigali dry port is not linked to a railway system; however, there are plans to construct a standard gauge-railway that connect the dry port with the Port of Mombasa and Dar es Salam.[8]

The dry port will include storage facilities including bonded storage and cold storage. With regard to security and freight visibility, the dry port will make use of RFID tags to track the location of containers. The dry port will be equipped with sufficient space for loading and offloading operations; this is expected to ensure low waiting times and turnaround times of trucks.[9]

2.1.3.4 Lessons Learned

The comparison of the current Modjo Dry Port and planned Green Logistics Hub with the City Deep in Johannesburg/South Africa, the Cikarang Dry Port in Jakarta/Indonesia and the Masaka Inland Container Depot in Kigali/Rwanda revealed a number of findings, which could provide value to the envisioned development at Modjo.

What all three countries have in common is the high share of road transport in hinterland transport, i.e. cargo and freight volume between the ports and the economic hinterland. Although the direct costs of rail transport are lower than the direct costs of road transport, the higher road transport performance makes road transport the preferred modal option. However, at distances above 300 - 500 kilometres, a well performing rail transport system along with dry ports could be advantageous, both in terms of economic efficiency and externalities, such as congestion, pollution and accidents. Dry ports are crucial components in allowing rail transport to maintain its competitive advantage.

---

[8] The East African (2018): Masaka ICD to open in January, cutting time and cost of imports to the region, URL: https://www.theeastafrican.co.ke/business/Masaka-ICD-to-open-early-next-year/2560-4857148-ryxvqr/index.html (Accessed on 18.02.2019)

[9] The Construction Review Online, URL: https://constructionreviewonline.com/2018/08/rwandas-largest-inland-cargo-handling-facility-to-near-completion/ (Accessed on 18.02.2019)

As the case of City Deep in South Africa has shown, due the fact that at the time of construction the dry port was mainly designed to handle rail freight; in addition, since then, the volume of freight on trucks increased significantly. This led to traffic congestion at the dry port and its periphery. From this it can be concluded that for a dry port that relies on trucks for the first and last mile and, thus, pick-up and delivery by truck, there is need for an adequately structured and organised truck waiting area, traffic guidance schemes as well as loading and offloading area. Important to state is that this includes not only physical infrastructure of an adequate size, but well-organised and well-performing operations as well. Otherwise, truck waiting time prior to loading and offloading would add avoidable costs to goods.

As part of the latest upgrade of the City Deep Terminal, a new terminal operating system was implemented. The terminal operating system is exchanging data with all the country's and company's port terminals. This allows the integration of the terminal and transport operations more neatly as well as to track and trace shipments between the dry port and port terminals.[10] The latest developments at the City Deep and Cikarang Dry Port indicate that there is an increasing demand for a higher degree of integration between the seaports and dry ports as well as across modes of transport. Seaport development projects increasingly go in line with dry port development projects.

The City Deep and the Cikarang Dry Port suffered from high rates of theft. Whilst the City Deep Terminal invested in CCTC cameras and online container tracking, the Cikarang Dry Port provides online container tracking; the Masaka Inland Container Depot provides real-time container tracking by means RFID technology. These cases show that predictability and visibility is of high importance and rail transport has to match the same level in order to be competitive.

By providing final customs clearance, all three dry ports bring the customs clearance, inspection and documentary process closer to the origin and destination of cargo and serve as a fully-fledged port facility. What is important to point out, is that the Cikarang Dry Port provides a single window, the Indonesia National Single Windows, and thereby allows users to carry out the necessary document formalities related to the port, customs and quarantine at a single point of contact. That is expected to strengthen the dry port's positioning as a seamless extension of the seaport location.

Like in many countries, the involvement of the public sector in supply chain operations is still high and the City Deep Dry Port is no exception. However, in South Africa there

[10] Transnet Port Terminal, URL: https://www.transnetportterminals.net/About/Pages/Navis.aspx (Accessed on 18.02.2019)

is an urge by the private sector to allow for a higher participation in order to foster competition in supply chain areas, which currently still are dominated by the public sector. To increase the capacity of the dry ports and allow for a higher degree of participation of the private sector, a new dry port is planned. This will include design, building and operating as well as eventually to transfer the ownership of the facility to the public sector. By contrast, the Cikarang Dry Port is privately operated. Also the Masaka Inland Container Depot will be operated by a private company.

With regard to the go live and ongoing operation of the Masaka Dry Port, it was reported that the dry port operator plans to qualify and train stakeholders, such as freight forwarders, in order to allow for smooth operations, especially at the interface to transport operators and customers as well as to facilitate the establishment of the dry port.[11] This again shows, that besides the development of physical infrastructure and superstructure as well as equipment also the 'soft facts' are vital for the successful development of the logistics sector, the conduct of high performance supply chains as well as to contribute by this to the nation's development of wealth and living standards.

[11] The Construction Review Online, URL: https://constructionreviewonline.com/2018/08/rwandas-largest-inland-cargo-handling-facility-to-near-completion/ (Accessed on 18.02.2019)

Table 4: Overview of Compared Dry Ports

	Modjo, Ethiopia	City Deep, South Africa	Cikarang, Indonesia	Masaka Inland Container Depot, Rwanda
Target Demand				
Market	With its location at the interior of the country about 58 km away from the capital Addis Ababa and the road and railway corridor to the primary gateway of the country, the Port of Djibouti, the dry port serves the local market of the capital region, at least half of the domestic market of Ethiopia and will as well as overseas export markets.	With its location in proximity to the main gateways (Durban Port, Ngqura Port, OR Tambo Airport) of the country, at the main economic centre of South Africa and the southern African region and along the North-South Corridor, the dry port serves the local market of the Gauteng Province, the domestic market of South Africa as well as landlocked and coastal countries further north.	With its location in the immediate hinterland of the Port of Tanjung Priok at Jakarta, within the Jababeka Industrial Estate, next to various international manufacturing companies, the dry port serves the local market in West Java and Java as well as overseas international markets.	With is location next to the capital Kigali, its road and (planned) rail transport corridors to Mombasa and Dar es Salam, and its transport corridors to neighbouring countries, the dry port is expected to serve the local market of the capital region, the domestic market of Rwanda, the corridor markets in Uganda, DR Congo, Tanzania and Burundi and overseas export markets.
Physical Conditions				
Year of Construction and Start of Operations	Start of operations 2009	1977	2011	1st Phase: 2016 – 2018 To be opened at the beginning of 2019 2nd Phase: after phase 1
Land size (hectares)	62 ha	20 ha for the railway siding and container yard	200 ha in total; 70 ha for dry port and terminal facilities, about 20 ha for the container yard and railway siding; 130 ha for the logistics park	30 ha
Location Considerations				

	Modjo, Ethiopia	**City Deep, South Africa**	**Cikarang, Indonesia**	**Masaka Inland Container Depot, Rwanda**
Geographic Location	The dry port is located about 80 km away from the capital; The major corridor and gateway is Addis Ababa – Port of Djibouti.	4 km south east of the Johannesburg Central Business District	The dry port has access to two main gateways in eastern African, the port of Mombasa in Kenya and Dar es Salaam in Tanzania.	The dry port will be located outside the capital Kigali, 20 km away. This is expected to reduce and keep traffic away from the city.
Role in Transport Network	Primary dry port of the country operated by a state-owned entity (ESLSE)	One of six inland dry ports in the country; but the only with role of a dry port, i.e. including full customs clearing service	Extension of the Panjung Priok seaport in Jakarta; West Java	Single dry port of the country
Support Infrastructure				
Rail Yard	4 tracks, each with a length of 250 metres	4 tracks, each with a length of 700 m	1 track, with a length of 650 metres	Railway planned; not details available yet
Container Yard	Built with a storage capacity of 14,908 container; in 2018 more than 130,000 full import TEU have been handled	Capacity of 400.000 TEU p.a.; 2000 terminal ground slots; 700 slots for empties, equipped with Rail-Mounted Gantry Cranes	Capacity of 400.000 TEU p.a.; expandable to 2.5 million p.a. The yard provides 128 reefer plugs with uninterruptable power supply; free storage is 5 days for import after ATA; 7 days for export prior to ETD of the vessel	Size of 1.2 hectares; capacity of 50,000 TEU p.a.
Container Freight Station	The dry port provides currently four CFS at a size of 0.5 ha each. These facilities are mainly used for customs clearance only. Handling of export cargo is foreseen for the future.	Various container freight stations in City Deep	3.888 sqm of warehouses for LCL.	CFS available, but no details

	Modjo, Ethiopia	City Deep, South Africa	Cikarang, Indonesia	Masaka Inland Container Depot, Rwanda
Storage			Bonded storage with 11.960 sqm warehouse; 82.293 sqm warehouse under construction	Size of 1.96 hectares, of warehouses including cold and bonded storage; capacity of 640,000 tonnes
Empty Container Depot	The facility provides empty container storage operated by special empty container handlers	Private companies provide container maintenance services	Empty container depot, encompassing empty container storage, clearing and repair	
Road Transport Connectivity	A highway connects the Modjo Dry Port with the Port of Djibouti. The distance between Addis Ababa and Port of Djibouti is 918 km. The 'last mile' between highway junction and dry port gate lead the road traffic unfortunately through the city centre of Modjo town.	Road connections to all ports of the country; about 600 km by road to the Port of Durban	Road connections to the Port of Panjung Priok, about 55 km away	The dry port will be connected to the port of Mombasa and Dar es Salam (see plans for rail to Tanzania below)
Rail Transport Connectivity	A railway connects Addis Ababa with the Port of Djibouti. The distance between Addis Ababa and the Port of Djibouti is 781 km; a new standard gauge railway line; a regular rail service started operations beginning of 2018	Railway connections to the Port of Durban (about 700 km), to Port of Nqgura and Cape Town	The dry port is located at the main railway of Java; direct railway access; daily railway services Kalimas Surabaya in East Java	A railway with Standard Gauge between Tanzania and Rwanda is planned, which will feed the Masaka Inland Container Depot.
Airport Connectivity	Road connections to the Bole International Airport, about 80 km	Road connections to the OR Tambo International Airport, about 30 km	Road connections to Jakarta International Airport, about 80 km	Road connections to the Aéroport International de Kigali, about 10 km

	Modjo, Ethiopia	**City Deep, South Africa**	**Cikarang, Indonesia**	**Masaka Inland Container Depot, Rwanda**
Inland Waterway Connectivity	Not available	Not available	Not available	Not available
Development	Major extension in 2019 (up to 120 ha additional space available)	Last major update in terms of handling equipment in 2015; to provide additional capacity, another dry port, Tambo Springs, about 30 km away from City Deep is developed	-	-
Business Model				
Function	Facilitate foreign trade, currently only import; involvement of export cargo flows and the private sector planned from 2019 on; reduce port storage costs at the Port of Djibouti; reduce load on Port of Djibouti; improve supply with regard to containerized (and in the future bulk cargo (e.g. fertilizers))	Deep City Dry Port and its upgrading are an important component of the public rail transport company's road-to-rail-strategy to move more freight from road to rail	Container dwell time was high at the Panjung Priok Port; to increase the capacity and reduce the dwell time, the Cikarang Dry Port was developed	To reduce the transport costs between the two gateways and Kigali. To reduce the shortage of warehouses, e.g. for raw material and finished products; to distribute freight to neighbouring Uganda, Tanzania, Burundi, and DR Congo.
Type of cargo / freight	Container, general cargo (future dry bulk and perishable goods)	Container, dry bulk	Container	Container, bulk cargo
Activities	Consolidation, deconsolidation, transhipment of rail freight, intermodal transhipment between rail and road transport, customs clearance	Consolidation, deconsolidation, transhipment of rail freight; intermodal transhipment between rail and road transport, full customs clearance	Consolidation, deconsolidation, transhipment of rail freight; intermodal transhipment between rail and road transport, full customs clearance	Consolidation, deconsolidation, full customs clearance

	Modjo, Ethiopia	**City Deep, South Africa**	**Cikarang, Indonesia**	**Masaka Inland Container Depot, Rwanda**
Nearby Economic Activity	With its central location, close to the country's capital Addis Ababa, the location is not only a major point of consumption and production, it also serves as a major point of consolidation and deconsolidation for the entire country; major area for growing vegetables and fruits in the vicinity of the dry port	The City Deep Dry Port is part of the industrial development zone City Deep; Johannesburg and Gauteng Province with various large scale logistics and manufacturing companies; Johannesburg Market, a 65,000 sqm facility and market of fruit and vegetables	The Cikarang Dry Port is surrounded by a high number of companies, including various global players; the dry port is next to the Jababeka Industrial Estate	Kigali Special Economic Zone nearby
Complementary Services				
Customs services	Customs clearance; based on transit agreement between Djibouti and Ethiopia as well as clearing in Modjo instead of Addis Ababa; final clearance in Modjo	Final customs clearance; 24/7 and 365 days	Customs services are 24 / 7 and 365 days, including bonded transfers to the Port of Tanjung Priok; dry port is connected to Indonesia National Single Windows (INSW); physical inspection and final clearance is provided at the dry port. X-ray Scanners are available	Final customs clearance in Kigali
Online Cargo Management	-	-	The dry port offers online container tracking	An online service will be provided to process necessary documents, including invoicing for services and duties RFID tags will allow real-time cargo tracking

	Modjo, Ethiopia	**City Deep, South Africa**	**Cikarang, Indonesia**	**Masaka Inland Container Depot, Rwanda**
Public and Private Participants				
Public participants	Operated by public transport operator, ESLSE Ethiopian Shipping and Logistics Services Enterprise, own and operates dry port	Public rail transport operator, Transnet Freight Rail, owns and operates the dry port	-	-
Private participants	Private participation planned for expansion area	Despite public ownership and operations, private companies are allowed to use the infrastructure and facilities; the new Tambo Springs Intermodal Terminal will be operated by a private operator	Private dry port; Container freight station is operated by private warehouse operator	The government granted a licence to a major international transport terminal operator (DP World) to construct and operate the dry port for a period of 25 years.

Source: Research Sellhorn-HPC

2.1.4 Identified Requested Service Portfolio

Modjo Dry Port is currently being used as a customs clearance point to reduce dwell-time as well as container demurrage, detention costs and storage charges in Djibouti. Furthermore there is an imbalance of import and export cargo. Coffee (washed at farmer's facilities and cleaned at exporters facilities around Addis) or horticulture products are transported directly to Djibouti by truck. Containers being used for imports to Ethiopia are currently mostly returned empty to Djibouti. One objective of this study is to propose a future service portfolio which transforms the dry port into a common use area with a wide range of services being offered. The identified requested services are the result of the comprehensive market environment analysis described in previous sections.

The services could be provided

a) by the MGLH administration and operator ESLSE to the private operators of logistics facilities within the MGLH, or

b) by the logistics facilities operators themselves to their clients.

In the following, the portfolio's components of MGLH, which have been outlined during market study, will be explained.

2.1.4.1 Export Consolidation and Storage

Currently, Modjo Dry Port is used for stuffing or un-stuffing of import containers only. An additional service which should be part of the future MGLH portfolio is the consolidation of cargo volume for export shipments.. If multiple farmers or exporters supply one buyer, their cargo can be consolidated at Modjo, stuffed in one or more containers as less than container load and transported by train to Djibouti. But coffee is just an example.

Exporter's incoterm usually is FOB (free on board). This means that the exporter has to cover all costs for all operations and transports until the container is loaded on board the ocean vessel. By delivering his goods only to Modjo by truck and share the rail transport for the container with other exporters, the total transport costs can be reduced.. Apparently logistics costs in Ethiopia are too high. Export consolidation is a good procedure to reduce logistics costs. For the efficient consolidation of export cargo facilities for interim storage and container stuffing as well as suitable equipment like fork lifts are required.

To enable such services two ways of provision of facilities are possible:

a) Pre-built (basic) facilities built by the MGLH administration will be provided to private operators who bring additional machinery (e.g. for bagging or washing coffee) into the per-built facilities and conduct the logistics services, or

b) The MGLH administration provides land, and basic utilities and the private operator builds the facility on his own expenses and to his specific needs to conduct the required logistics services.

In both cases a rent has to be paid to the MGLH administration. The provision of equipment like forklift, reach stacker, terminal trailer etc. to enable the stuffing of container, service of storage and movement of full and empty containers could be either done by the MGLH administration or by the private operator.

2.1.4.2 Import Deconsolidation and Distribution Processing

Although the handling of import container and the cargoes within is the core business of the current Modjo Dry Port, efficient container destuffing/deconsolidation procedures have not been established so far. The destuffing due to customs' requirement or due to pick-up of cargo by cargo owners/buyers takes place at several areas within the yard today. The following figures show one example.

Figure12: Current Destuffing of Container for Customs Control

Source: SELLHORN-HPC 2018

The picture above shows the destuffing of a container at one of the four existing warehouse. The warehouse provides a ramp which would enable the use of a fork lift and speed um destuffing operations. But the container cannot be placed on ramp's level as no trailer is available for that. Hence, every single item has to be carried manually out of the container which requires workforce and time.

Figure13: Detailed Customs Check

Source: SELLHORN-HPC 2018

The restructuring of the deconsolidation of import containers would be a distinct improvement of Modjo Dry Port which then is integrated in the MGLH. According to cargoes' requirements additional facilities might be provided equipped with shelves or other facilities within the warehouses. The required fork lifts or other rolling equipment could be provided by a MGLH equipment pool or procured by the import warehouse operators directly.

2.1.4.3 Intermodal Facility and related Services

A critical part of the future portfolio is the provision of logistics services, for the intermodal connection between rail and trucks. By implementing an intermodal transfer facility at MGLH, the operational capacity, efficiency and range of logistics services will be improved. The direct rail connection between Modjo and Djibouti, which has been opened for cargo movement in November 2017, allows the transport of large volumes from and to Modjo and makes MGLH an ideal handling point for further distribution to inland destinations by truck. The aim is not only to transport containers

by train, but also dry bulk cargo in hopper cars. Rail transport generates the following advantages:

- High load capacity (70 tonnes per car). Pulses with high weight are appropriate cargo for rail transport rather than transport by truck.
- Rail transport is environmentally friendly. No risk of traffic-related bottlenecks (truck queue). Railways also use less fuel and cause less pollution.
- Shorter transit time, no bottle necks when train arrives at Modjo. Higher throughput
- Concentrated rail flows with high levels of planning repetition. This provides a stable and consistent operating plan with a high utilization rate

Due to poor road conditions on the route between Modjo and Djibouti, containers often arrive damaged or even get lost. Truck trailers often do not have corner castings, so the container is not adequately secured on truck.

A current handicap of rail transport is its connectivity to some terminals in Djibouti. The following figure shows the end of the rail track in Djibouti which is at least 1 km away from terminal boundaries.

Figure14: Rail Connectivity of MPT at Djibouti

Source: Goggle Earth; processed by HPC 2018

The new multipurpose terminal in Doraleh, Djibouti, which is used for discharging fertilizer and grain, is not closely connected to the ending part of the railway. Considering rail transport for these products would cause truck shuttle transfer and double handling, which rise costs. It will need to be a fast transfer to avoid demurrage charges for the vessel. But the extension of the track is planned for completion and would probably be available by the time of implementation. The investment is needed as soon as possible.

It is recommended to offer intermodal facility services through the MGLH administration as it is actually part of the container handling in the container yard. Because investment in additional rail cranes and rack length expansion is quite high it is unlikely to find a private operator. And as only ESLSE is currently authorized to conduct the multimodal transport, on Ethio-Djibouti Rail is the only rail operating company the range of rail-related 'customers' for the intermodal facility is very low, which again makes an operation of the intermodal facility unattractive for private operators.

2.1.4.4 Bulk Cargo Handling and Facilities

The market survey has identified two target bulky products, which should be handled at MGLH in the future: grain and fertilizer. Fertilizer is free of import duty. Once it arrived by train at Modjo, it would be transferred to silos. The total silo capacity should be 100,000 to 150,000 tonnes the volume of two to three shiploads (in average one shipload consists of 50,000 tonnes). Instead of bagging at Djibouti Port, bagging would be carried out at Modjo and the bags put in the warehouse for later delivery or directly on the truck in order to be stored in warehouses closer to final destination. For both commodities, grain and fertilizer, also unloading facilities (e.g. conveyor belt systems) and silo storage facilities are required. The responsibility for investment in silos, bagging and blending facilities should be decided on a case to case basis.

2.1.4.5 Cool Chain Facility and Services

The implementation and optimization of cool chain procedures go along with the intention to increase exports out of Ethiopia through Modjo. Instead of delivering cargo by refrigerated truck to Djibouti and stuffing it in reefer containers there, MGLH can offer a cold storage facility to shorten the distance the refrigerated truck has to go. Once cargo is ready for export, a reefer container can be provided from the empty depot at Modjo (ideally a reefer container which has been used for previous import) and cargo can be stuffed in it. From that point on, the cargo will not be removed out of the reefer container until it has been delivered to final destination or an interim cold storage

facility at the country of destination. The cool chain will not be interrupted in Djibouti. Target products for this procedure are horticultural products such as fruits and vegetables. The Ethiopian Horticulture Producer Exporters Association (EHPEA) counts 114 members with 85% being active in exports. 30 members are fruit and vegetable exporters.

It has been also stated by market stakeholders that stuffing services at MGLH would be very much appreciated as they could be monitored by the regional exporting companies. A monitoring of the truck unloading and container stuffing procedures at Djibouti Port are mainly not controllable as these companies do not have staff in Djibouti.

Beside horticulture products and vegetables also frozen food (especially meat) is also a suitable commodity which needs special storage facilities and well experienced handling as well as continuous cool chain handling.

2.1.4.6 Storage, Washing and Repairing Facility and Services for Containers, Cranes, Trailers, and Trucks

The quantity of cargo being handled in Modjo is going to increase which causes more stress and possible damage of the equipment used. For this reason, a maintenance area needs to be considered to make immediate repair possible and keep the MGLH efficiency on a high level. In addition, there must be a repair and cleaning area for containers. Currently, the share of containers arriving damaged at Modjo is very high due to poor road conditions and the way containers are secured on truck. It is mandatory that the container complies with the ISO standards after having been repaired. Before a container can be used for an export, it must be cleaned.

Regarding the provision of workshop services for trucks, it is already at this stage recommended to relate these services only to trucks operated within MGLH (like for transport from the warehouses to the container yard and vice versa or trucks used for internal movements within the importers or exporters premises) or for trucks that literally break down inside MGLH and need an emergency repair to reach the next workshop outside MGLH in order to be completely repaired.

The establishment of a service station or workshop for all kinds of equipment supposed to be operated in MGLH should be provided. Due to time critical stuffing and destuffing operations especially for cool chain related cargo, it is recommended, that the workshop unit at MGLH offers a mobile workshop service enabling the mechanics to drive with an appropriately equipped van directly to the warehouses in order to repair e.g. the fork lift on-site. This saves a lot of time for the warehouse operators as the damaged or non-operational equipment does not have to be moved to the workshop. “The workshop

comes to the equipment". This provides again the opportunity to agree with the private operators on annual service agreements, which could define and ensure the availability of certain services on short notice. An example to visualize this idea is shown in the following figure.

Figure 15: Workshop Service Van

Source: Flying Fox 2018, Switzerland

2.1.4.7 Other Value Services and Administration

Almost all stakeholders being interviewed in the market survey named value added surveys as one of the most important components to be part of the MGLH future portfolio. Depending on the product, there are various operations and services which can be done at MGLH:

- Packaging / re-packaging
- fumigation
- labelling
- washing and other treatment
- processing (milk) bagging
- incinerator or other equipment for destroying spoiled products

- Banking
- Insurance
- Freight Forwarding
- Customs Clearance

During market analysis, cut flowers have been identified as a commodity which mainly is transported via airfreight. Its supply chain appears to be set up well, so cut flowers will not be considered as a target commodity for MGLH.

2.1.4.8 Customs and Quarantine (CQ) Service and Trade Control

The administration of the MGLH should provide space on its premises for customs control of containers and other cargoes and commodities, quarantine procedures as well as veterinary inspection office. Also, phytosanitary services, ISO inspections and laboratory examination are recommended to be provided. These services could not be offered by anyone other than the customs administration or public entities. For the shippers, as well as private logistics providers, the availability is important and generates flexibility in integrating these services and procedures in their logistics chain.

The establishment of bonded warehouse is of high interest for importers as well as for exporters.

2.1.4.9 Access Control and Security

Access control and provision of facilities to ensure a secured environment within the MGLH premises is important for all involved parties. Currently, pedestrians can access many areas of the Modjo Dry Port. This is risky for several reasons, but mainly theft and manipulation of cargo. Beside the security aspect also the safety aspect can be improved by controlling the access to specific areas of the MGLH.

This service has to be provided by the MGLH administration which again might hire a security company for that. But only the administration can be responsible for it.

2.1.4.10 Power Supply Facility and Services

Regardless who will finally provide the required facilities the MGLH administration has to provide power (mainly electricity) to the user of the MGLH. The dimensions of

needed power supply facilities will become clear during the elaboration of the masterplan.

2.1.4.11 Water Supply Facility and Services

As well as the previously described provision of power also the provision of water a kind of an official duty which again can only be provided by the MGLH administration. Water supply is essential for all users and employees of the MGLH.

2.1.4.12 Services for Truck Drivers

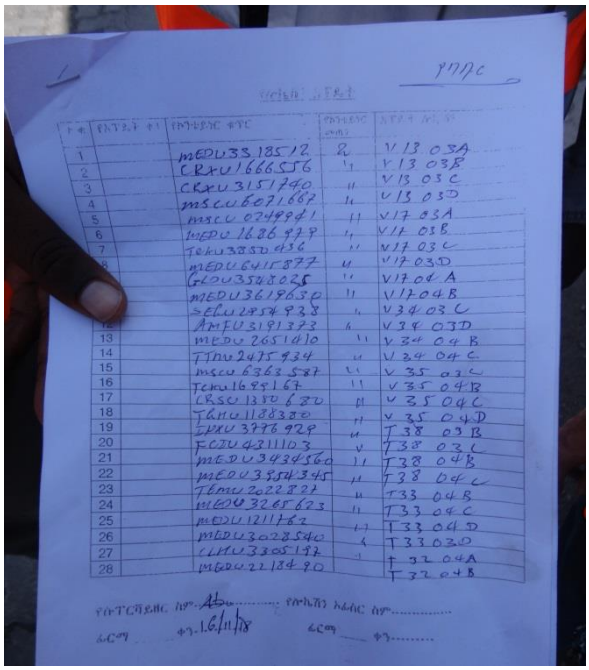
The provision of services for truck drivers cuts both ways. On the one side a facility like the MGLH provides an opportunity to establish shops, cantinas, washing rooms etc. for truck drivers. When referring to the basic idea of so-called freight villages also the provision of filling station, truck washing facility and workshop is part of the strived service portfolio. This is good for the driver and for sure manageable within the very first years of the further development of Modjo Dry Port into a MGLH.

A fully utilized MGLH, operating at peak situations of truck and rail traffic and struggling for short turn-around times for trucks and minimal internal container movements (from yard to warehouse, from warehouse to yard, from yard to rail etc.), one of the major aims is to get (the trucks) and truckers off the MGLH premises as fast as possible to avoid heavy congestion. Hence, less space for parking slots is available and no parking trucks are desired as they might block the traffic lanes.

2.1.4.13 ITC System / Terminal Operating System

In order to reach the required aims regarding reduction of container dwell time on the MGLH premises, efficient container yard operations by exact documentation of each single container location. Currently there are supervisors documenting the locations as well as delivery or dispatch notice manually, which will be later processed by data entry team which put the written information in the current IT administration system.

Figure 16: Current Documentation of Container Location



Source: HPC 2018

In order to improve efficiency the real-time collection of data is necessary. If the throughput of containers will increase remarkably and the container dwell time will decrease data has to available fast. With the current system it might happen that the container has already left the terminal before its receipt has been even documented. When handling more than 200,000 TEU per year (sum of incoming and outgoing container) a suitable IT solution is recommended. Modjo Dry Port already handles more than 200.000 TEU and already reaches 500,000 container movements per year as it is expected that each container has to be moved several times (e.g. from delivery truck into the storage, and from storage onto dispatch truck and in between some of them have been probably shifted, because they stood on other containers which were needed first). An appropriate TOS also reduces the number of shifted containers. These movements are completely on the expenses of ESLSE as no client would pay for container movement caused by insufficient storage administration. Hence, a huge

potential of cost reduction is linked to the opportunity to reduce shifted containers. An advanced IT system also enables the dry port operator to receive cargo and container data in advance, which again would speed up the gate-in and/or gate-out process as well as the loading/unloading of truck, as the handling each preannounced truck could be implemented in the resource and workload planning of employees and equipment.

2.2 Traffic Forecast

Relevant data provided by the Client as well as by previous studies and the market expertise of the Consultant have been enhanced by findings of the market survey conducted in November and December 2018. These serve as the basis for the traffic forecast, which estimates the potential cargo volumes for the MGLH and calculation of reasonable cargo projections for the next 25 years up to 2043. Several competitiveness factors are taken into account.

In order to define the basis for the assumptions used for the forecast, the total Ethiopian import and export in tonnes for 2012 to 2017 have been considered. In order to prove the valid correlations between traded volumes and country-related macro-economic indicators the following table shows the total national import and export volumes as well as the gross domestic product GDP on a constant price basis expressed in '000 USD and the GDP per capita expressed in USD.

Table 5: National Import & Export 2012-17 and relevant Macro Data

	2012	2013	2014	2015	2016	2017	CAGR
Import total ['000 tonnes]	9,288	9,448	11,272	12,333	13,820	12,176	5.6%
growth		*1.7%*	*19.3%*	*9.4%*	*12.1%*	*-11.9%*	
Export total ['000 tonnes]	1,319	1,339	1,560	1,463	1,665	1,768	6.0%
growth		*1.5%*	*16.5%*	*-6.2%*	*13.8%*	*6.2%*	
Im-/Export total ['000 tonn	10,607	10,787	12,832	13,796	15,485	13,944	5.6%
growth		*1.7%*	*19.0%*	*7.5%*	*12.2%*	*-10.0%*	
GDP [million USD]	42,210	46,534	54,151	63,069	70,865	78,726	13.3%
growth		*10.2%*	*16.4%*	*16.5%*	*12.4%*	*11.1%*	
GDP per capita [USD]	458	492	558	635	696	754	10.5%
growth		*7.4%*	*13.4%*	*13.8%*	*9.6%*	*8.3%*	

Source: EMAA 2019; African Statistical Yearbook 2018

All indicators mentioned above express a robust growth with a CAGR above 5%. Ethiopia is one of the most dynamically growing countries in Africa. A strong relationship between the development of historical data and the mentioned macro figures improves the suitability for being valid as predictive indicators used in the traffic forecast.

The macro data taken from the African Statistical Yearbook 2018 and the cargo data provided by EMAA have been correlation tested. The closer the factor turns out being to one the stronger the variables are related to each other. The following table shows, that the chosen variables are correlating very strong.

Table 6: Correlation Test

Correlation based on 2012-2017	
Import vs GDP	0.863268
Export vs. GDP	0.929654
Import vs. GDP per capita	0.875527
Export vs. GDP per capita	0.925568

Source: SELLHORN-HPC; EMAA 2019; African Statistical Yearbook 2018

The methodology of the traffic projections are based on correlations (linear regression) between the volumes of cargo and macroeconomic variables, such as GDP and population growth, internal consumption, and trade combined with a micro economic assessment, as far as reasonable. Used inputs such as future development of macroeconomic variables in the region have been obtained from institutions such as IMF, World Bank, and AfDB. Furthermore, the analysis considers historic hinterland traffic data as far as available but to a maximum of the previous ten years. The gathered market survey information and data have been collated by expert interviews with market and supply chain stakeholders as mentioned in section 2.1.2.2 This has been identified as very crucial in order to identify the main potential drivers of the development and growth of traffic.

The analysis considers the key export and import cargo flows and commodity supply chain. On the import side, main categories are dry bulk, break bulk and containerized cargo. In this sense, the analysis will consider the unique characteristics of these chains, and proposals derived from the market study will reflect future cargo volume development of these different supply chains. For export the main focus is on agricultural products like coffee, vegetables and fruits (horticulture) as well as oil seeds.

The often discussed potential generated by the Ethiopian flower exporting industry is expected not to materialize for MGLH as especially this almost 100%-reliant on air cargo sector has established an efficient supply chain at and around the Bole Airport of Addis Ababa including storage and packaging facilities.

2.2.1 Container (Import & Export)

The container forecast considers historic throughput volumes of the years 2008-2017 (to the extent available) and apply a combined multiplier-approach reflecting the well-accepted relationship between the development of container throughput as well as the development of GDP. The overall Ethiopian container traffic is forecasted to grow at an

average rate of 6.1% (CAGR, compound average growth rate) within the projection period from 2018 – 2043.

The aforesaid multiplier approach considers for TEU growth in comparison to GDP growth a factor of 1.16 derivated from the period 2012 – 2017. This multiplier has been taken for 2018 and decreases afterwards gradually. The following table shows the development in 5-year steps.

Table 7: Ethiopian Container Forecast (2018 - 43)

	2012	2013	2014	2015	2016	2017	2018	2020	2025	2030	2035	2040	2043	CAGR ('18-
Ethiopian Container Volume [TEU]	346,634	370,395	428,092	495,908	583,601	596,451	652,494	772,046	1,147,858	1,640,049	2,178,005	2,654,107	2,876,062	6.1%
Growth Rate [%]		6.9%	15.6%	15.8%	17.7%	2.2%	9.4%	8.6%	8.0%	7.0%	5.1%	3.4%	2.4%	

Source: EMAA, AfDB African Development Bank

As shown in the table above the total national container volumes is expected to grow. The total Ethiopian container volumes include full and empty import as well as export containers. It has been assumed based on historical data that the majority of imported container are full representing a share of >99% of the imports. The share of full export containers will reach a share of up to 20% of total containers. The container volume handled by MGLH is also expected to grow, but the comparatively high percentage of container handling via Modjo will be influenced by several developments. These mainly are:

- Development of other dry ports within the current catchment area of the Modjo Dry Port.
- Especially the implementation of the Andode Dry Port, which will be located directly in the Addis Ababa City region, will have an impact on the container volume supposed to be handled at MGLH.
- The number of empty export containers to be handled at the MGLH.

When defining the parameters for the container forecast it has been assumed that all of the incoming full containers are also handled as export containers at Modjo – whether as full or empty containers. The development of the Modjo share on Ethiopian total full import container over last years is shown in the following table.

Table 8: Historical View on Distribution of Full Import Container

	Condition	Unit	2012	2013	2014	2015	2016	2017	2018
Ethiopia Total Imports	Full in	TEU	175,763	192,804	214,577	252,049	295,476	304,338	332,610
Growth	*Full in*	*%*		*9.7%*	*11.3%*	*17.5%*	*17.2%*	*3.0%*	*9.3%*
Ethiopian Dry Ports Share	Full in	*%*	*11.2%*	*31.5%*	*39.6%*	*45.4%*	*53.8%*	*55.6%*	*49.7%*
Ethiopian Dry Ports Volume	Full in	TEU	19,629	60,799	84,869	114,369	158,971	169,241	165,247
Growth	*Full in*	*%*		*209.7%*	*39.6%*	*34.8%*	*39.0%*	*6.5%*	*-2.4%*
Modjo Share of Dry Ports	Full in	%	54.9%	64.9%	63.7%	75.3%	78.6%	78.6%	79.1%
Modjo Volume	Full in	TEU	10,786	39,461	54,044	86,160	124,949	133,070	130,747
Growth	*Full in*	*%*		*265.9%*	*37.0%*	*59.4%*	*45.0%*	*6.5%*	*-1.7%*
Modjo Share of Total Imports	*Full in*	*%*	*6.1%*	*20.5%*	*25.2%*	*34.2%*	*42.3%*	*43.7%*	*39.3%*

Source: Based on data from EMAA and market survey

The development regarding growth rate of full import container for total Ethiopian national import, total Ethiopian dry port containers as well as volumes handled at Modjo principally follow the same trend – except 2018. In 2018 a slight decrease of containers handled via the dry ports has been experienced while the total container import volume increased. Between 2012 and 2018 the imported containers into Ethiopia have almost double from 175,000 to 332,000 TEU.

The following table shows the expected volume development at Modjo. Based on the data available it has been observed, that the in 2018 the full import container volume handled at Modjo Dry Port has decreased by -1.7% compared to 2017. When projecting the container volume for Modjo GLH it has been assumed, that the current market share will slightly increase up to 44% again until 2025 (market share in 2017 has also been almost 44%). Until the end of the projection period the role of Modjo will still be strong but the share at the overall Ethiopian container volume will decrease to 37.5%; mainly driven by the establishment of additional dry ports and the competition coming along with it.

Table 9: Modjo GLH Container Forecast 2018 - 43

	2012	2013	2014	2015	2016	2017	2018	2020	2025	2030	2035	2040	2043	CAGR ('18-'43)
Modjo Share of Ethiopian Container Volume[%]	6.1%	20.5%	25.2%	34.2%	42.3%	43.7%	39.3%	40.6%	44.0%	40.0%	39.0%	38.1%	37.5%	
Volume handled at Modjo [TEU]	21,238	75,553	107,554	169,446	246,755	260,665	256,364	313,678	504,806	655,693	849,836	1,010,097	1,077,984	5.9%
Growth Rate [%]		255.7%	42.4%	57.5%	45.6%	5.6%	-1.7%	10.4%	9.7%	4.9%	4.6%	2.8%	1.9%	

Source: based on data from EMMA, AfDB, ESLSE

It has been assumed that the overall distribution of full and empty container regarding import and export will be the same at Modjo like on the national level. The consideration of empty and full container has an impact on the capacity calculations that will be conducted later in this report.

Table 10: Distribution of Ethiopian Container Volumes (Full & Empty)

	2012	2013	2014	2015	2016	2017	2018	2020	2025	2030	2035	2040	2043	CAGR ('18-'43)
Ethiopian Container Volume [TEU]	346,634	370,395	428,092	495,908	583,601	596,451	652,494	772,046	1,147,858	1,640,049	2,178,005	2,654,107	2,876,062	6.1%
Import - Full [TEU]	175,216	191,554	213,519	251,831	295,396	304,042	332,610	392,950	581,988	828,341	1,095,799	1,330,159	1,438,031	6.0%
Import - Empty [TEU]	547	1250	1058	217	81	296	324	383	571	817	1,086	1,326	1,438	6.1%
Export - Full [TEU]	37,053	38,259	42,694	38,484	49,993	49,207	53,830	1,930	11,479	102,731	251,076	445,669	573,774	9.9%
Export - Empty [TEU]	133,818	139,332	170,821	205,376	238,131	242,906	265,729	376,783	553,820	708,160	830,044	876,953	862,819	4.8%

Source: Based on data from EMAA, ECC, Market Survey

Regarding the CAGR the full export containers are experiencing the highest percentage growth.

2.2.2 Grain (Import)

Although 2017 has provided a record harvest of 4.6 million tonnes of wheat, Ethiopia imported more than 1.1 million tonnes of wheat the same year. Both, population and continuous economic growth as well as urbanization over the last decade have led to a distinct increase in demand and change in Ethiopian nutrition, which currently cannot be covered by the national wheat sector. In 2018 the GOE announced the target that Ethiopia should become wheat self-sufficient until 2022 [12] Despite the political willingness experts from the International Maize and Wheat Improvement Centre

[12] https://www.cimmyt.org/a-wheat-self-sufficiency-roadmap-for-ethiopias-future/

(CIMMYT) doubt the self-sufficiency as all relevant measures like education of farmers, provision of modern equipment, breeding of new resilient seeds and establishment of incentives to grow wheat cannot be implemented in such a short time. The GTP II describes that the main source of increase in production of cereals is land productivity growth rather than expansion of cultivated area.[13] Hence, the import of grain is expected to be necessary mid-term and even long-term, if only within a lower growth rate range. Considering all these planned and conducted efforts, the long-term growth rate of imported grain has been assumed being set on the lower side being 2.5% for 2018 in order to gradually slow down to 0.7% in 2043.

Table 11: Ethiopian Grain Forecast

	2012	2013	2014	2015	2016	2017	2018	2020	2025	2030	2035	2040	2043	CAGR ('18-'43)
Ethiopian Grain Volume ['000 tonnes]	1,114	1,320	1,910	1,910	2,611	1,120	1,148	1,204	1,338	1,462	1,569	1,653	1,692	1.6%
Growth rate [%]		18.5%	44.7%	0.01%	36.7%	-57.1%	2.5%	2.4%	2.0%	1.6%	1.3%	0.9%	0.7%	

Source: EMAA, CIMMYT

Due to the central location Modjo is assumed being a very suitable location to start national distribution of grain. The opportunity, to transport grain in bulk from Djibouti will be cheaper by rail in the future than by trucks today. This does also underpin the suitability of MGLH becoming a major grain distribution centre. The fact that Modjo serves the most populous region is a further argument. Due to that it is expected that the Modjo share for grain will reach 30% by 2025 and 50% by 2043 which is the end of the projection period.

Table 12: Grain Modjo Import Volume

	2022	2023	2024	2025	2030	2035	2040	2043	CAGR ('22-'43)
Modjo Share of Ethiopian Grain Volume[%]	30.0%	31.7%	33.3%	35.0%	39.2%	43.3%	47.5%	50.0%	
Volume handled at Modjo ['000 tonnes]	377.6	407.1	437.4	468.4	572.5	679.7	785.4	846.0	3.9%
Growth Rate [%]		7.8%	7.4%	7.1%	3.8%	3.3%	2.7%	2.4%	

Source: EMAA, CIMMYT

[13] GTP II (p. 20)

As the grain imports are public procurement a political decision could be impact the supply chain, by entitling MGLH as the national grain facility. But this is not expected.

2.2.3 Fertilizer (Import)

The import of fertilizer is increasing related to the increase of export of agricultural goods and the national supply as Ethiopia's population is growing. As fertilizer is improving the crop yield, a 10% increases in exports led to an increase of fertilizer import by 2.5%.

End of 2016 an agreement between Morocco's Office Cherifien des Phosphates (OCP), the world's largest phosphate exporter, and the state-run Ethiopian firm Chemical Industries Corporation (CIC) has been signed, to construct a new fertilizer production plant at Dire Dawa. The investment stated at that time was USD 3.7 billion. The plant is proposed to have a capacity of producing 2.5 million tonnes of fertiliser annually, which could be extended by further investment of around USD 1.3 billion to 3.8 million tonnes per year later on.[14]

As this one plant would be technically able to provide sufficient fertilizer for the total national supply, this would have a distinct impact on fertilizer imports. OCP is planning to ship the required phosphoric acid to the new Ethiopian plant which is produced at OCP plants abroad. The imported phosphoric acid will be likely routed in liquid bulk via Djibouti Port. Additionally required potash will be transported from large reserves in the Horn of Africa region including the Danakil depression in the Afar Region of Northeast Ethiopia. Hence, the distribution of bagged ready-to-use fertilizer for the Ethiopian market might be handled from Dire Dawa directly and a distribution centre at MGLH does not seem reasonable. Although the project itself is still not realized, the progress and willingness for implementation has been confirmed by Moroccan and Ethiopian officials during the latest AU African Union summit in February 2019 in Addis Ababa. If the plant would be implemented, the assumed demand for imported fertilizer could be reduced to close to nil. Further opportunities will be later described in the fertilizer business model option.

Despite all existing avowals the realization is not assured, as any construction works have been started or announced so far. For the case distinct delays occur during the establishment of the fertilizer plant or its cancellation, a case with a 5% increasing

[14] Source: https://www.reuters.com/article/morocco-fertilizers-ethiopia/moroccos-ocp-and-ethiopia-sign-large-fertiliser-plant-deal

development of fertilizer import which will decrease to 2% within the projection period until 2043.

Table 13: Ethiopian Fertilizer Import Volume Development

	2012	2013	2014	2015	2016	2017	2018	2020	2025	2030	2035	2040	2043	CAGR ('18-'43)
Ethiopian Fertilizer volume ['000 tonnes]	971	574	859	691	845	918	964	1,059	1,313	1,582	1,852	2,106	2,243	3.4%
Growth rate [%]		-40.9%	49.7%	-19.5%	22.2%	8.7%	5.0%	4.8%	4.2%	3.6%	3.0%	2.4%	2.0%	

Source: Based on dat from EMAA and market survey

Assuming that the plant will not be constructed as planned the share of fertilizer distributed via Modjo is expected to increase to 50% in 2025. Afterwards the share is gradually increasing to 45% in 2043 as it expected that more dry ports will serve as fertilizer distribution centre in the future. The opportunity to transport fertilizer by rail in bulk enables the reduction of the selling price which again is supporting the farmers.

Table 14: Modjo Share of Fertilizer Import

	2022	2023	2024	2025	2030	2035	2040	2043	CAGR ('22-'43)
Modjo Share of Ethiopian Fertilizer Volume[%]	45.0%	46.7%	48.3%	50.0%	48.6%	47.2%	45.8%	45.0%	
Volume handled at Modjo ['000 tonnes]	521	564	609	657	769	875	965	1,009	3.2%
Growth Rate [%]		8.3%	8.0%	7.8%	3.0%	2.4%	1.7%	1.4%	

Source: Based on data from EMAA and market survey

2.2.4 General Cargo (Import)

General cargo is mainly steel and other heavy cargo with comparatively long cargo dwell times in the Port of Djibouti today. The figure from 2012 to 2017 show that the handled volume is quite volatile.

Table 15: Ethiopian General Cargo Development

	2012	2013	2014	2015	2016	2017	2018	2020	2025	2030	2035	2040	2043	CAGR ('18-'43)
Ethiopian General Cargo Volume ['000 tonnes]	2,379	2,167	2,530	2,964	2,774	1,831	1,994	2,341	3,362	4,514	5,611	6,472	6,836	5.1%
Growth rate [%]		-8.9%	16.8%	17.1%	-6.4%	-34.0%	8.9%	8.1%	6.9%	5.5%	3.8%	2.3%	1.6%	

Source: Based on data from EMAA and market survey

Due to the central location of Modjo it might be geographically suitable for a distribution centre for general cargo. But due to quite challenging operation because of weight general cargo has not highest priority to be established at Modjo. It might be that political agreements between Djibouti and Ethiopia can also force the clearing of (long standing) general cargo off the Port of Djibouti. Again due to Modjo central location and access to huge consumer group the potential market share for Modjo is high and start with 15% in 2022 in order to rise to 25% in 2043.

Table 16: Modjo Share of General Cargo Development

	2022	2023	2024	2025	2030	2035	2040	2043	CAGR ('22-'43)
Modjo Share of Ethiopian General Cargo Volume[%]	15.0%	16.7%	18.3%	20.0%	21.4%	22.8%	24.2%	25.0%	
Volume handled at Modjo ['000 tonnes]	409	489	576	672	965	1,278	1,564	1,709	7.0%
Growth Rate [%]		19.5%	17.9%	16.7%	6.9%	5.1%	3.5%	2.7%	

Source: Based on data from EMAA and market survey

2.2.5 Vehicles (Import)

Whilst the International Organization of Motor Vehicle Manufacturers (OICA) reports that the number of vehicles in use, i.e. registered vehicles, amounts to 155,000[15], a number of reports cite the Ministry of Transport of Ethiopia in numbering the vehicles to 587,400 in 2015[16] and 831,000 in 2017.[17] As a result, the motorisation rate varies from two to eight vehicles per 1,000 people. Irrespective of the precise number, these figures are low compared to other countries. For instance, the motorization rate in Kenya is 28 and in Nigeria 21 vehicles per 1,000 people. The motorization rate of Ethiopia is among the lowest or even the lowest worldwide. Against the background of the low motorisation rate, a young and growing population with a size of about 100 million people and a growing income per capita, the vehicle market in Ethiopia is still at an early growth stage.

Whilst the OICA reports growth figures of vehicles in use in Ethiopia of about two to three percent on average over the last years, a report cites the Ministry of Transport in numbering the growth rate of vehicles to six percent in 2015. In Kenya and Nigeria, the numbers grow at four and seven percent per annum, respectively, according to the OICA. Despite considerable additional costs on car imports, import figures have been increasing.

One of the obstacles to a higher motorisation rate in Ethiopia is the low income of the broad population. The high level of taxes on private vehicles in Ethiopia make the desire of the ownership of a vehicle for many people even more unattainable.[18] In addition, the weakness of the Ethiopian currency against the US-Dollar contributes to the high import costs – of both import finished cars and import assembly kits and components. It was reported that the costs of purchasing a vehicle are much lower in neighbouring Kenya.

15 International Organization of Motor Vehicle Manufacturers (OICA): statistics on vehicles in use, URL: http://www.oica.net/category/vehicles-in-use/ (last access 08.03.2019)

16 Deloitte (2015), Navigating the African Automotive Sector, URL: https://www2.deloitte.com/content/dam/Deloitte/za/Documents/manufacturing/ZA_Deloitte-Africa-automotive-insights-Ethiopia-Kenya-Nigeria-Apr16.pdf (last access 08.03.2019)

17 2Merkato.com (2017). , URL: http://www.2merkato.com/news/alerts/5294-ethiopia-has-more-than-831000-vehicles-on-its-streets (last access 08.03.2019)

18 BBC.com (2017): Why are cars so expensive in Ethiopia?, URL: https://www.bbc.com/news/world-africa-38607986 (last access 08.03.2019)

Despite the attempt of the Government of Ethiopia to support local vehicle manufacturing and a number of approved licenses to vehicle manufacturers, most Ethiopians prefer foreign vehicles. It was reported that although the production capacities exist to produce more vehicles in Ethiopia, the quality and durability of foreign produced vehicles is said to be much higher than locally produced vehicles. It was reported that at least 6 vehicles assembly plants are located in Ethiopia, with an annual production output of 8,000 private and commercial vehicles. This production output is, however, far below its capacity.[19]

The average age of the vehicle fleet on Ethiopian streets is reported to record 15 to 20 years.[20] The high age of the existing fleeting indicates that there is not only a demand resulting from a growth in population and income but also from the need to replace the ageing existing fleet. It is estimated that 85 percent of all vehicles are second-hand imports.

Table 17: Key Market Figures

Indicator	
Motorization rate	Between 2 and 8 per 1,000 people
Number of vehicles in use	Between 155,000 and 587,000 vehicles
Market growth rates	Between 2 and 6 %
Import volumes	165,000 vehicles (acc. to DPFZA)
Average age of vehicle fleet	15 – 20 years
Import share of total vehicle fleet	85 %

Source: Deloitte 2015; Organization of Motor Vehicle Manufacturers (OICA)

Whilst the OICA estimates that each year, 18,000 vehicles are imported to Ethiopia, press articles cite the Government of Ethiopia in stating the number to 110,000 cars in 2016. The main gateway for vehicle imports to Ethiopia is the Port of Djibouti.

The Port of Djibouti along with the electrified railway to Ethiopia is not only regarded as a gateway for finished vehicle imports, but also – with regard to the future prospects – to component import and finished vehicle export.[21] Recently, the Volkswagen Group

19 BBC.com (2017): Why are cars so expensive in Ethiopia?

20 Deloitte (2015), Navigating the African Automotive Sector

21 Reuters.com: Ethiopia to expand tiny car assembly business in industrial drive, URL: https://de.reuters.com/article/ethiopia-autos-idUKL5N18I090 (last access 08.03.2019)

signed a Memorandum with the Government of Ethiopia to establish a vehicle assembly plant in Ethiopia.[22]

The DPFZA provided import volumes 198,000 tonnes in 2017 to Ethiopia, corresponding to about 165,000 vehicles. When analysing the vehicle throughput data of the Port of Djibouti, it becomes clear that quite stable over last five years Ethiopia received 85% of cars handled as RoRo in Djibouti. The overall tonnes handled in Djibouti as well as in Ethiopia match quite well with the units of cars. By this n average a car has a weight of around one tonne. The main exporter of cars to Ethiopia is Japan. In 2017 the number of handled Japanese units reaches a share of 75%. Due to growing economy and remarkably growing GDP the growth rate of 6.3% for 2018 have been taken. The vehicle volume forecast mainly considers passenger cars.

Table 18: Ethiopian Vehicle Import Volume Development

	2012	2013	2014	2015	2016	2017	2018	2020	2025	2030	2035	2040	2043	CAGR ('18-'43)
Ethiopian Vehicles volumes ['000 tonnes]	165	170	140	183	177	198	211	241	362	650	1,048	1,301	1,361	7.7%
Growth rate [%]		2.7%	-17.4%	31.0%	-3.5%	11.9%	6.3%	7.2%	9.3%	14.5%	7.4%	2.7%	1.0%	

Source: Based on DPFZA, market survey

Vehicles are already handled in container at Modjo Dry Port. With the opportunity to bring vehicles on special rail cars and therefore expecting an effect on economies of scale it is expected that the volume of handled cars will increase. Based on historical information the market share of Modjo Dry Port was 7.2% of the total Ethiopian vehicle import. During the market survey consultant investigate that a long-term market share for MGLH of 10% is realistic.

22 Volkswagen Group (2019): Volkswagen develops automotive industry in Ethiopia, URL: https://www.volkswagenag.com/en/news/2019/01/Volkswagen_develops_automotive_industry_in_Ethiopia.html (last access: 08.03.2019)

Table 19: Modjo Share of Vehicle Development

	2015	2016	2017	2018	2020	2025	2030	2035	2040	2043	CAGR ('18-'43)
Modjo Share of Ethiopian Vehicles Volume[%]	7.2%	7.4%	7.6%	7.8%	8.1%	9.1%	10.0%	10.0%	10.0%	10.0%	
Volume handled at Modjo ['000 units]	13.2	13.1	15.0	16.3	19.6	32.8	65.0	104.8	130.1	136.1	*8.8%*
Growth Rate [%]		-1.0%	14.7%	9.0%	9.7%	11.6%	16.6%	7.4%	2.7%	1.0%	

Source: Based on ESLSE, market survey

2.2.6 Coffee (Export)

Coffee is one of the most important export commodities for Ethiopia. The GOE represented by Coffee and Tea Development and Marketing Authority has conducted measures to support farmers and other stakeholder of the production chain in order to increase coffee production and by this the export volumes. Hence, the export of coffee is expected to increase. As the annual growth targets of the Coffee and Tea Development and Marketing Authority of around 20% in 2017 have not been reached the assumed growth rate for coffee exports have been defined lower than that. From 2015 – 2017, coffee exports have increased by a CAGR of 9.4%. This growth rate has been assumed for 2018 in order to decrease to 4% in 20143.

Table 20: Ethiopian Coffee Export Development

	2012	2013	2014	2015	2016	2017	2018	2020	2025	2030	2035	2040	2043	CAGR ('18-'43)
Ethiopian Coffee volumes ['000	199	191	184	199	225	238	260	310	470	684	943	1,221	1,384	*6.9%*
Growth rate [%]		-4.0%	-3.7%	8.2%	13.1%	5.8%	9.4%	9.1%	8.4%	7.4%	6.1%	4.8%	4.0%	

Source: Ethiopian Coffee and Tea Development and Marketing Authority, Ethiopian Coffee Exporters Association

The Ethiopian Coffee Exporter Association is very interested in using facilities at Modjo as this opportunity would provide more control on the packaging and stuffing process. As a coffee is grown in western and south-western parts of Ethiopia, Modjo is suitable location for preparing the product for export. As there are current supply chains incorporated, Modjo might not utilize the whole potential. The Modjo share for export coffee is expected to increase to 25% in 2030 and then continues to increase to 30% until 2043.

Table 21: Modjo Share of Coffee Export

	2022	2023	2024	2025	2030	2035	2040	2043	CAGR ('22-'43)
Modjo Share of Ethiopian Coffee Volume[%]	12.0%	13.6%	15.3%	16.9%	25.0%	26.9%	28.8%	30.0%	
Volume handled at Modjo ['000 tonnes]	44	54	66	79	171	254	352	415	*11.3%*
Growth Rate [%]		23.4%	21.5%	20.0%	14.9%	7.6%	6.2%	5.4%	

Source: Based on Ethiopian Coffee and Tea Development and Marketing Authority, Ethiopian Coffee Exporters Association

2.2.7 Fruits (Export)

More than 90% of fruit production in Ethiopia is represented by mangos, avocados and bananas. Major growing regions are Amhara, Oromia and the Southern Nations, Nationalities and People's Region (SNNPR). The USAD Foreign Agricultural Service forecasted the volume of exported fruits being 22,000 tonnes.[23] In the years 2012 - 2017, the fruit export volumes have been developed by a CAGR of 11.3%. This growth rate has been assumed for 2018 in order to decrease to 10% in 2025 and to 4.5% in 2043.

Table 22: Ethiopian Fruits Export Development

	2012	2013	2014	2015	2016	2017	2018	2020	2025	2030	2035	2040	2043	CAGR ('18-'43)
Ethiopian Fruits Volumes ['000 tonnes]	13	14	18	18	21	22	24	30	49	70	91	115	132	*7.0%*
Growth rate [%]		12.4%	23.9%	0.6%	16.5%	4.8%	11.3%	10.9%	10.0%	5.5%	5.1%	4.7%	4.5%	

Source: Based on Ethiopian Horticulture Producer Exporters Association

Especially produce originated in Oromia and SNNPR are suitable to be channelled via MGLH and more than fifteen companies which are members of the EHPEA are located

[23] https://gain.fas.usda.gov

in the catchment area of Modjo. Due to this it has been assumed that up to 2025 the share of Modjo could reach 25% which is representing 12,000 tonnes.

Table 23: Modjo Share of Fruit Export

	2022	2023	2024	2025	2030	2035	2040	2043	CAGR ('22-'43)
Modjo Share of Ethiopian Fruits Volume[%]	20.0%	21.7%	23.3%	25.0%	30.6%	36.1%	41.7%	45.0%	
Volume handled at Modjo ['000 tonnes]	7	9	10	12	21	33	48	59	*10.4%*
Growth Rate [%]		19.6%	18.7%	17.9%	9.5%	8.5%	7.6%	7.1%	

Source: Based on Ethiopian Horticulture Producer Exporters Association

There intensive measurements under preparation as the GOE has involved Dutch Partners ("Flying Swans") who are very familiar with the European fruit and horticulture market and are assisting the Ethiopian agricultural sector to improve remarkably. Some stakeholder even mentioned that even on a mid-term period, export volumes between 200 and 300,000 tonnes could be expected.

2.2.8 Oilseeds (Export)

The major share of oilseeds is covered by two sesame types and soybeans. One sesame type is grown in the western part of Ethiopia. The export of oilseeds is projected by the USAD Foreign Agricultural Service projected the total export volume of 469,000 tonnes in 2018. This is a growth rate of 4.5%. This growth rate has been assumed to decrease to 3.5% in 2025 and to 2.7 in 2043.

Table 24: Ethiopian Oilseeds Export Volume Development

	2012	2013	2014	2015	2016	2017	2018	2020	2025	2030	2035	2040	2043	CAGR ('18-'43)
Ethiopian Oilseeds volumes ['000 tonnes]	297	339	337	533	367	449	469	504	600	703	812	934	1,014	*3.1%*
Growth rate [%]		14.2%	-0.6%	58.2%	-31.2%	22.4%	4.5%	3.6%	3.5%	3.0%	2.9%	2.8%	2.7%	

Source: Based on USDA Foreign Agricultural Service and market survey

Most of the sesame volume (up to 70%) is grown in the North-Western region of Ethiopia and is not expected to be routed via Modjo. But Modjo could act as consolidation centre for crops grown in the western part of Ethiopia. When transporting goods from interim storage facilities in Asosa and Nekemte, Modjo is directly located at

the Expressway to Djibouti. Modjo's current catchment area comprises the Western Ethiopian part as well as the Oromia region, where soybeans are grown. As these are the regions where the smaller share of oilseeds is produced, it has been assumed that a Modjo market share of 10% could be reached in 2025 in order to increase to 27.5% in 20143.

The establishment of the proposed dry port project planned at the location of Nekemte, which currently assessed being a secondary logistics node[24] is expected to have an impact on handled oilseeds volume, as Nekemte currently provides an interim storage facility for the Niger Seed harvested in Western Ethiopia.

Table 25: Modjo Share of Oilseeds Export

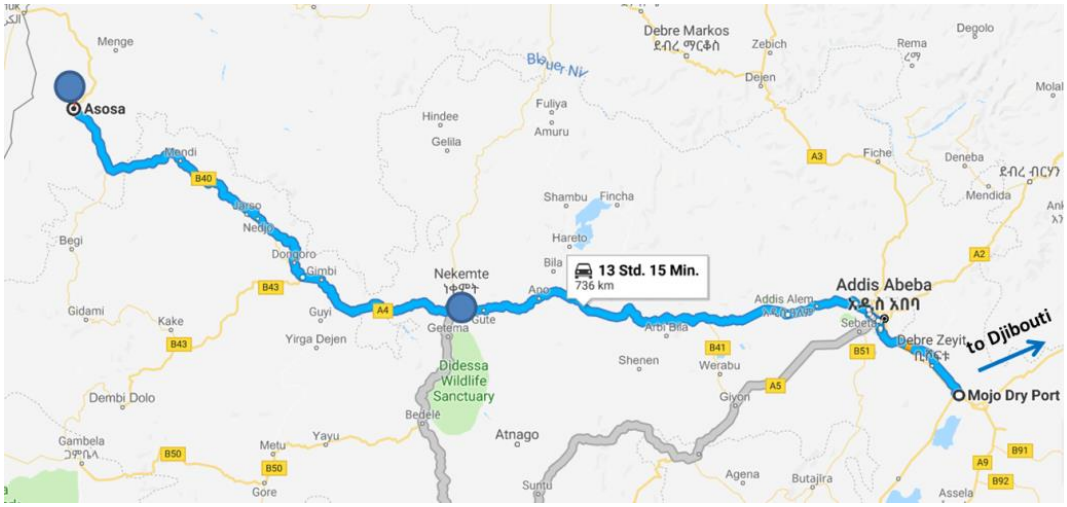
	2022	2023	2024	2025	2030	2035	2040	2043	*CAGR ('22-'43)*
Modjo Share of EthiopianOilseeds Volume[%]	7.0%	7.4%	7.9%	10.0%	14.9%	19.7%	24.6%	27.5%	
Volume handled at Modjo ['000 tonnes]	38	42	46	60	104	160	230	279	*10.0%*
Growth Rate [%]		9.9%	9.5%	31.7%	10.2%	8.2%	7.0%	6.5%	

Source: Based on USDA Foreign Agricultural Service and Market Survey

The following figure shows the locations of the interim storage in Asosa and in Nekemte as well as the route to Djibouti which just passes Modjo.

[24] according to AfDB definition

Figure 17: Route from Storage Locations in Western Ethiopia to Modjo



Source: Based on Google Maps

2.2.9 Vegetables (Exports)

By measures like educating farmers and providing suitable equipment and fertilizer to a market compliant price the vegetable sector will grow in the future. The historic volumes do represent mainly pulses volumes. Based on the growth rate in 2017 of 5% a constant rate of 5% has been assumed until 2025. Afterwards it is slightly decreasing totalling in CAGR of 4.9%

Table 26: Ethiopian Vegetables Export Volume Development

	2012	2013	2014	2015	2016	2017	2018	2020	2025	2030	2035	2040	2043	CAGR ('18-'43)
Ethiopian Vegetables volumes ['000 tonnes]					518	544	571	634	815	1,036	1,309	1,642	1,875	4.9%
Growth rate [%]						5.0%	5.0%	5.4%	5.0%	4.9%	4.7%	4.6%	4.5%	

Source: Based on data from EMAA and Ethiopian Horticulture Producer Exporters Association (EHPEA)

Due to several production sites in the catchment area of Modjo the share that Modjo is expected to get reaches 27.50% at the end of the projection period.

Table 27: Modjo Share of Vegetable Export

	2022	2023	2024	2025	2030	2035	2040	2043	*CAGR ('22-'43)*
Modjo Share of Ethiopian Vegetables Volume[%]	10.0%	11.7%	13.3%	15.0%	17.8%	20.6%	23.3%	25.0%	
Volume handled at Modjo ['000 tonnes]	70	86	104	122	184	269	383	469	*9.5%*
Growth Rate [%]		22.7%	20.1%	18.1%	8.2%	7.6%	7.1%	6.9%	

Source: Based on data from EMAA and Ethiopian Horticulture Producer Exporters Association (EHPEA)

The vegetables export comprises mainly pulses. The production of pulses is concentrated in the Amhara and Oromia regions. It is expected that Modjo handles 10% of the Ethiopian vegetables export in 2022, and the market share gradually increases to 20% in 2030. The export increases from 70,000 tonnes in 2022 to almost 185,000 tonnes in 2030.

The traffic forecast will constitute the basis for defining types and capacities of required facilities at MGLH within the projection period.

3. BUSINESS MODEL OPTIONS

Based on the demand analysis, the Consultant has identified specific strong opportunities for initiating the Green Logistics Hub and proving its capacity to deliver results consistently. These fall into three key areas, (1) transferring high volume bulk operations to the Modjo Green Logistics Hub for subsequent distribution, (2) providing efficient empty cleaning, container stuffing and logistics services at Modjo for agricultural export commodities, (3) providing consolidation and deconsolidation, packaging and cool chain processing for horticultural exports using sea freight to market and (4) making land for warehouses available to joint ventures that have a business plans that support achievement of objectives of GTPII and the Ethiopian National Freight Logistics Strategy. In each case, the Modjo operation needs to be considered as part of a secure, fast and cost effective supply chain between the maritime/port leg and Modjo Dry Port to illustrate the processes being recommended and their viability for the exporters and importers. The business models also include transferring iron and steel products, large equipment and other project cargo to Modjo for storage, clearance and distribution to project sites and transfer of vehicles to Modjo for collection by the buyers.

Adding bulk operations to Modjo Dry Port and Logistics Hub once the railway is operational has been discussed for a while. The goal is to stockpile and distribute essential commodities, such as grain, fertilizer and perhaps in future fuel, within Ethiopia. The hope is to deal with some of the obstacles to efficiency in the current systems and achieve a more reliable, cost effective intermodal system. The first two are GOE programs to meet critical needs, where Ethiopian priorities are taken into account and their cost reduced. Therefore it is existing cargo for which cost savings and reliability are being sought.

Adding an export processing area adjacent to the railway will foster Ethiopia's goal of increasing exports according to product development strategies in place through the GTP II and the development of industrial parts. Wagons carrying import containers would be shunted onto the sidings for offloading. In the meantime, export stacks would be prepared for loading and transporting to the container terminal at Doraleh. The concept is to create a reliable flow of empty containers from the import section to clean, maintain and stuff for key exports such as coffee, sesame, pulses, etc. It is also designed to serve import and export requirements for the manufacturing sector around Addis Ababa, Gelan and other areas developing on the route from Addis Ababa to Adama.

Adding a cool/cold chain between Djibouti and Addis Ababa, including Modjo. Initially, Modjo is being explored on the basis of horticultural products being prepared, processed, inspected and certified, packaged and exported. Modjo processing can access inputs brought by the multimodal system and use the cool chain facility to prepare exports for Europe and the Middle East.

The MGLH should actively recruit investors to create joint ventures that will profit from the services offered at Modjo and the supply chains being fostered from production site, to one stop regulatory implementation, benefiting from the security, speed and reliability of the standard gauge railway and a smooth bilateral operation at Djibouti facilitated by EMAA and Djiboutian agencies. To reduce the cost of making refrigerated containers available for exports, EMAA should encourage investors with plans to import goods requiring cool chain services, so that reefer containers will be loaded in both directions and an effective cross docking operation can be developed that obtains maximum fast and productive use of expensive reefer containers.

A goal of GOE is to transfer steel, heavy machinery and other project cargo inland to Modjo for distribution to project sites. Vehicles are currently being transferred to Semera for interim holding and then to Gelan. A business model is also being developed for their efficient transfer to Modjo for collection by project owners and drivers.

3.1 Business Model for Import and Distribution of Fertilizer

3.1.1 Financial, Regulatory, Institutional and Procedural Considerations

The government is the sole distributor of manufactured fertilizer that is imported by the Ethiopian Agricultural Business Corporation (EABC), which includes the former Agricultural Inputs Supply Enterprise (AISE) as one of its components. The activities performed by EABC include procurement, port clearance through agents, coordination of transport to a network of Cooperative Unions and EABC warehouses, and sometimes delivery to the final customer. This system was adopted to reduce cost through economies of scale in procurement and delivery, rather than individual Unions and private sector logistics companies doing the procurement and distribution themselves.

The Ministry of Agriculture prepares a yearly farmer's demand forecast in August based on inputs from its extension agents at the individual farm and *kebele* level. The demand forecasts are consolidated into regional requirements. The forecasts are compared with the trends from previous years and the GTP's production goals to arrive at the amount to be

procured. Ethiopia has been importing an increasing amount of processed fertilizer (estimated to increase about 7-15% each year), primarily DAP and urea, however, it is now adopting specialty fertilizers to meet the needs of particular crops and soils rather than the current use of DAP throughout the country. This change to 5-6 additional types will add complexity to the procurement, handling and delivery systems, but should improve agricultural outputs.

The Ministry uses the resulting forecast to issue orders for imports to EABC. [25] Fertilizer is purchased through international competitive tender. Typical tenders are for 200,000 to 250,000 tonnes shipped C&F. Five to seven bidders usually compete. The bids are reviewed and contracts awarded by a separate government committee. The government provides the foreign exchange, EABC opens a letter of credit, and the fertilizer is shipped according to an agreed-upon schedule.

The period during which fertilizer is used extends from May to September, the main agricultural season in Ethiopia. Farmers purchase fertilizer during the planting and growing season from Union or EABC warehouses. Tenders for procurement of imports are issued in September and the fertiliser begins to arrive in December. Typical shipment sizes are 50,000 tonnes shipped in bulk vessels of that size, although it is understood that there is planning to use larger, 70,000 vessels, which would place further strains on the importation arrangements. The supplier notifies the EABC of the shipment date, and this information is passed on to the Maritime Affairs Authority. For example, the tender issued in September 2018, includes four fertilizer types arriving in 20 shipments of mostly 50,000 tonnes between November 2018 and March 2019 mostly alternating between the SDTV terminal (operating at the old terminal and mostly limited to 25,000 metric tonnes ships) and the new Doraleh Multi-Purpose (DMP) terminal. The total order is 1,125,000 tonnes.

When shipments are unloaded, the fertilizer is inspected for quality, granularity and weight, and cleared by customs. The inspection is done by the Ethiopian Conformity Assessment Enterprise. Currently, the cargo is then unloaded using ship's gear, bagged on the wharf, and loaded into trucks for direct delivery to warehouses throughout the country. The typical daily offloading rate is about 3,500 allowing vessels to turn around in 12 to 15 days. To avoid overlapping schedules, the contract stipulates two shipments

[25] The forecast does not take into account the impact that forecasts consistently overestimated demand, which has led to some overstocking and resulting carrying cost.

should arrive every two weeks. When cargo is loaded onto trucks for delivery, it becomes the responsibility of EABC.

Table 28: Location of Zonal Warehouses

Region	Number of Warehouses
Oromiya	53
Amhara	37
Tigray	1
Benishangul	2
SNNPR	11

Source: Agricultural Input and Ouput Marketing statistics, Ministry of Agriculture, November 2018

The fertilizer is transported directly from the vessels to the warehouses using hired trucks. The EABC invites transport companies to bid for hauling to any of the zonal warehouses. It then awards the contract to the lowest bidder for each route. This year it has a total of 18 transporters delivering to the approximately 100 warehouses. The trucks deliver the cargo from the vessel to the farmers union's storage facilities or to EABC warehouses. Average distance from port to the EABC warehouses is 860 km. For shipments to more remote destinations, cargo usually is offloaded at the central warehouse in Adama to reduce the round-trip travel time from the port. Shipments are subsequently picked up for delivery from Adama to up-country warehouses. This practice shows the appropriateness of the Modjo location, which is nearby. The delivery times from Djibouti range from 1 or 1.5 days for Adama to 3 days for Nekempte (1,257 km).

A major problem in the number of trucks required in a short period of time, accentuated by the fact that the bagging operation directly from ship to truck means that any delay in trucks slows the ship offloading process. When major shipments arrive, they utilize a major share of the total national truck fleet. Hauling fertilizer pays less well than containers, so the government needs to exercise pressure for trucks to prioritize hauling of fertilizer. A further issue is that off-loading at zonal warehouses is done manually by work gangs that are contracted and managed by the municipality. It is difficult to control the speed of their work. The shipments are affected by storage capacity and speed of work throughout the delivery chain. Delivery is done first to about 100 zonal warehouses around the country. From there it is carried to primary warehouses for sale to farmers. Primary warehouses hire local transport companies to collect from the zonal

warehouses. If they are slow, then the zonal warehouses can become full, with no capacity to receive the next delivery. For large warehouses, there may be multiple trucks trying to deliver fertilizer at the same time, which can also slow the offloading process and increase the turnaround time of the trucks and delay their readiness for the next load.

Use of fertilizer to increase crop productivity is a major goal of the GOE, therefore resolving these logistics inefficiencies in this complex program is a major goal of the national logistics strategy.

3.1.2 Preliminary Business Model: Bulk Handling of Fertilizer at Modjo

Opportunity: The fertilizer industry is using mostly 50,000 tonnes ships now. Handling the increased size would place further burden on the Djibouti bulk terminals, DMP and SDTV, and the entire delivery system but should bring some cost reductions. Now that the railway is operational, bulk shipments to Modjo for bagging and distribution from Modjo could reduce the cost and time of delivering fertilizer to farmers as well as enhancing the timeliness of delivery to farmers. It would also incur more costs in Ethiopian birr rather than USD and create more jobs in Ethiopia.

Priority: Delivery of fertilizer is a high priority of the Growth and Transformation Plan. Fertilizer will be critical to achieving GTPII agricultural targets and a major quality of livelihood objective.

Criteria for Success: Fertilizers must be received at the right time in the growing cycle. The fertilizer cost to the farmer must be the same or lower than for the previous year. Fertilizer is sold to farmers for the cost of procurement and delivery. EABC does not seek to make a margin for this service.

Proposed System:

- Determining demand and tendering of shipments would be carried out in the same way as presently by the Ministry of Agricultural and EABC, respectively.
- On ship's arrival, the fertilizer would be tested for quality, quantity and granularity by the Ethiopian Conformity Assessment Enterprise. The test allows the transfer of responsibility for the goods. Customs and other agencies requirements can be carried out at Modjo.
- Currently, the railway spur to DMP has not yet been completed. As a result the railway operates an annual contract with a road transport company to carry dry bulk product from the DMP terminal to the Negad rail terminal which is about 12 km away from DMP. The railway indicated that as many as 15 trucks will

offload directly into 15 rail wagons manually with railway work crews. The railway indicated that the process of loading the 37 wagon takes five hours. The railway incorporates the logistics cost of this process into the transport cost for 7-8 USD per tonne. Once the rail connection to DMP is completed, it should reduce the rail cost by this amount.

- It is proposed that the automated handling system once the rail connection is completed could be as follows: At DMP, a fertilizer ship can be off loaded by conveyor belt directly into the silos behind the two bulk terminals. From there, a conveyor belt would convey the fertilizer directly to the rail wagons. The 37 wagon train would be consolidated at Negad for haulage to Modjo. In this process, the silo serves as a buffer, so that the offloading from the ship can be continuous and not affected by the speed of loading the train. It is understood that rather than charge a daily demurrage penalty in the maritime charges, the shipping line factors the anticipated length of moorage into the price. If berth times are reduced, it should nevertheless have an effect on the maritime costs.
- Based on railway capacity and proximity/cost of delivery to specific locations, some deliveries might go from the ship to trucks for delivery. The north would continue to be handled by truck, since going by way of Modjo would add considerably to the distance.
- At Modjo, the fertilizer would be transferred from the rail wagons to bulk storage warehouses. The total warehouse capacity should be 100,000, the volume of two shiploads. In this way, the warehouses would also allow a buffer in the process. At present the volume that would continue to be loaded on trucks for direct delivery from the ship needs to be calculated.
- Instead of bagging at the port, bagging would be carried out at Modjo. It is recommended that the release from the silos is through the bagging equipment and directly into the trucks staged for deliveries. Alternatively the bags would be put in a moisture controlled warehouse for pickup and delivery to the local warehouses. EABC would arrange the shipments from Modjo Dry Port to their warehouses through road transport tenders, much as they currently are.

As discussed above a contract has been signed for the construction of a fertilizer plant at Dire Dawa. Depending on this development these plans may need to be adjusted.

Time, Cost and Reliability

One-way delivery time varies from two to four days depending on the distance. For the road transport operator planning availability of trucks to serve a shipload of cargo the roundtrip to get a truck back for a new load is double this, up to as much as ten days. In fact it is reported that there are a variety of factors that delay the road transport operator

at the delivery warehouse, including lack of local laborers to offload and insufficient warehouse space as well as roads blocked by accidents. These factors will also affect the proposed system and would need to be addressed.

Analysis of Cost for Proposed System

The proposed system would use rail to Modjo, bagging and regulatory inspections at Modjo and loading trucks for delivery to Zonal warehouses. Therefore many of the costs currently being incurred at Djibouti are moved to Modjo and incur costs and generate jobs within Ethiopia which is a benefit to GOE. For example, the cost of off-loading and bagging in Djibouti is 15 USD per ton, while in Ethiopia it can be assumed to be considerably less in birr and a source of employment for Ethiopians. Because the transport and delivery costs are charged to the individual farmers when they purchase fertilizer it is critical that the new system is not more expensive than the current system. Small holders are very sensitive to even small changes in cost and also likely to protest since their livelihood is at stake. The difference in transport costs will be tested below for impact assuming that many of the other costs will be the same or less when transferred from Djibouti. Warehouse destinations from different parts of the country were used to determine viability. Rail rates were included in Birr for 40 tonnes so that they could readily be compared with the current road transport rates, despite the fact that each hopper wagon can carry 70 tonnes. Payment would be made on the basis of total volumes carried. Table 26 compares the transport cost for the current all road system with the proposed intermodal system using rail from Djibouti to Modjo and road transport from Modjo to the destination zonal warehouse. The current system rates are those contracted to the lowest cost bidder for the route. They therefore assume they are competitive rates. For the proposed intermodal system, the rail rate is based on the price agreed in a recent contract between the Ethio-Djibouti Railway and EABC. The road transport rates are based on the same ton/km rate as the full route for the remaining distance. The exception is Modjo to Addis Ababa which has been increased to match the on-going rate between the two points. The two modes are then total. The last column represents the estimated savings over the current route. This amount would be used for the operating cost of the Modjo fertilizer operation. Taking the average savings of 4619 Birr times roughly 53 warehouses in Oromia would contribute 244,807 to the operating budget. If Oromia, SNNPR and Benishangul were served the contribution of 304,848 Birr would be contributed for handling a larger volume.

Table 29: Current and Proposed Transport Cost Comparison (Fertilizer)

Warehouse Location	Current Transport System	Proposed Delivery System			
	All road route (Birr)	Bulk Rail Movement to Modjo (Birr)	Road Transport Bagged from Modjo to Warehouse (Birr)	Total (Birr)	Savings
Addis Ababa	47,504	37,992	9000	46,992	512
Nekempt	61,648	37,992	19729.2	57,721	3,927
Jimma	63,040	37,992	20782.4	58,774	4,266
Hawasa	53,864	37,992	10240	48,232	5,632
Arba Minch	64,964	37,992	22024.8	60,017	4,947
Shashemene	51,996	37,992	8971.2	46,963	5,033
Assosa	86,400	37,992	40392	78,384	8,016

Source: Agreed road transport rates for 2018—2019 and contracted rail price for fertilizer to Modjo.

Rates would need to be negotiated with the railway on the basis that the fertilizer business would be high annual volumes for full train loads from terminal to terminal. Table 27 assumes a discount of 10% of the rail tariff on the basis of high volumes and regularity of the schedule. The savings indicated would be used to offset added handling charges at Modjo dry port. At this rail tariff, serving Oromia only will generate approximately 446 thousand Birr toward the operating budget and serving Oromia, SNNPR and Benishangul would contribute approximately 556 thousand Birr.

Table 30: Current and Proposed Transport Cost Comparison with Rail Reduction of 10%

Warehouse Location	Current Transport System	Proposed Delivery System			
	All road route (Birr)	Bulk Rail Movement to Modjo (Birr)	Road Transport Bagged from Modjo to Warehouse (Birr)	Total (Birr)	Savings
Addis Ababa	47,504	34,193	9000	43,193	4,311
Nekempt	61,648	34,193	19729.2	53,922	7,726
Jimma	63,040	34,193	20782.4	54,975	8,065
Hawasa	53,864	34,193	10240	44,433	9,431
Arba Minch	64,964	34,193	22024.8	56,218	8,746
Shashemene	51,996	34,193	8971.2	43,164	8,832
Assosa	86,400	34,193	40392	74,585	11,815

Source: Agreed road transport rates for fertilizer transport for the 2018—2019 season and contracted rail price for fertilizer to Modjo.

EABC Executive Officer indicated that they had had some preliminary discussions with transporters and they had indicated the charges would be higher for a shorter distance, which was less viable for them. Table 28 looks at this issue for two of the cities above.

With the longer distances and turnaround times at each end, the number of trips a month would be considerably less than shorter, shuttle trips from Modjo. In fact, at the same rates as the longer routes, equal or greater earnings can be realized from the short trips with at least one third of the distance. Once the shuttle trip is shorter than that, the rate will need to be higher to equal or exceed the longer route.

Table 31: Comparison of all-Truck to Intermodal Earnings for Fertilizer

Destination	Distance from Djibouti	Trips per month	Earnings (Birr)	Distance from Modjo	Trips per month	Earnings (Birr)
Jimma	1271	2	126080	419	7	145,476.8
Hawasa	1052	2	107728	200	8	81,920.0

Source: Agreed road transport rates for fertilizer for 2018—2019

The next table provides some insights on volumes that might go through Modjo on the intermodal system and those that would remain on an all truck service. The location and road structure make Modjo suitable serving just Oromia, the largest program, which would mean delivering about 382.7 thousand tonnes a year. Adding the South Region to Oromia could be a total of 580 thousand tonnes. The Amhara deliveries would definitely be on road until rail service was opened to Kombolcha in 2020 and then a similar intermodal service might be developed at Kombolcha for the North. The Kombolcha Dry Port is being relocated to a 35 hectare area along the railway and near the industrial park. Once the new dry port is built at Hawassa, an all truck southern hub and spoke system might be developed at Hawassa in which case it might be determined that Modjo should be developed to serve only Oromia.

Table 32: Planned Fertilizer Deliveries for 2018/9 in Oromia, Amhara and SNNPR

Region	NPSB	NPSZnB	Urea	Total Tonnes
Southern Region	1,428,699		545,000	197,369.9
Oromia	1,925,000	220,000	1,681,500	382,650.0
Amhara	2,269,970	856,842		312,681.2

Source: Ethiopian Agricultural Business Corporation

Note: Quantities of each fertilizer type is given in quintal and converted to tonnes in the total.

Ensuring Reliability

- Planning and tracking software to monitor and integrate maritime and surface transport and procedures for planning and coordination
- Cycling deliveries from Modjo will be easier and have fewer cost implications

Recommendations and Action Plan:

1. Monitor planning and timing for the rail connection to the DMP and the efficiency of the off-take proposed.
2. Preliminary negotiation of high volume rates with the railway. It is assumed that by the time Modjo is operational, the connection to DMP will be complete eliminated the truck handling and reducing the rate for rail handling of bulk and general cargo. It is also assumed that based on high volumes and regularity of service the cost should be further reduced for fertilizer and grain.
3. Plan for the extension of the bulk rail line into the Logistics Hub and the operational plans for Modjo, positioning of the silos and warehouse, and plan for bagging and blowing machinery. Determine the advantage of bagging for storage in the warehouse or of bagging on pickup to avoid double handling.
4. Plan for regulatory cooperation concerning customs, health and quality.
5. Plan the road system in the Logistics Hub for pickup of bagged fertilizer by delivery trucks. Additional gates for the export deliveries into Modjo for processing and exporting by rail as well as the gates for bulk delivery trucks. It will need to take into account the number of trucks engaged and seasonality/emergency situations. The Ministry of Agriculture has indicated that the position of Modjo is ideal for reaching its zonal warehouses. The silos will enable more staging of trucks over a period of time than when the bagging is done on the wharf and speed of offloading the ship is directly tied to the availability of trucks in a continuous flow, which has been problematic. It can be observed that the system of bidding being used for fertilizer is reducing the coast of road transport. It is believed that once the shuttle system is established it will be very efficient and benefit transport companies with high volume, profitable routes.
6. Design a handling and distribution system for a greater variety of fertilizer types.
7. Finalize volume rates with the railway and road transporters based on high volumes at critical periods during the growing cycle.
8. Implement and fine-tune the system. Evaluate for continuous improvement.

3.2 Business Model for Grain Imports

3.2.1 Financial, Regulatory, Institutional and Procedural Considerations

Ethiopia imports grain to supplement its own production. Although cereal production accounts for about 80% of total cultivated land, there is still a shortfall in meeting national needs, which varies from year to year based on weather and other factors. Imports are primarily wheat and represent about 30% of total wheat consumption. The Ethiopian Trading Business Corporation, World Food Program (WFP), United States Agency for International Development (USAID), and the Emergency Food Security Reserve Administration are the major wheat importers into Ethiopia. WFP is currently doing most of their importation through Berbera because of the greater efficiency and proximity to their main destination at present, the Somali region of Ethiopia. Wheat imports are duty free.

The Ethiopian Trading Business Corporation (ETBC) is a government entity that purchases wheat with GOE and development partner funding and uses it to stabilize the domestic price for flour. It sells wheat to over 250 flour mills at a subsidized price in return for their selling flour at a regulated price below market value. Currently, ETBC is importing about 800,000 a year. The amount is determined by the Ministry of Finance and the program is administered by ETBC.

Cargo is shipped in bulk ships and unloaded at SDTV, which has a 35-year concession for handling bulk cargo at berths 14 and 15 of PAID terminal, and at the Doraleh Multi-Purpose Terminal (DMP). The terminal has vacuvators to convey the grain to flatbed silos or to bagging machines. Each of the vacuvators has a guaranteed discharge rate of 3,500 tonnes per day. Djibouti has minimum rainfall making uncovered systems possible. Modjo has 2-3 months of rain so the system would need to accommodate that rain in Modjo.

The handling charges are high for bulk commodities, $15 per ton, and the unloading rates are low. Berth performance is limited by the practice of bagging the cargo alongside the vessels and loading the bags onto trucks for direct delivery from the ship. DMP has 8 fixed bagging machines for grain that handle 300 t/hr/line and 6 mobile bagging machines. The SDTV terminal has 15 fixed machine used for grain and fertilizer as well as 12 mobile bagging machines. For grain, the SDTV bagging machines achieve 60 t/hr/line. The ability to maintain a continuous flow of trucks to pick up the bagged grain is seen as one of the major factors affecting the operations of the system and the tendency for high ship dwell times at Djibouti.

Because of limited equipment at the berth and competition for berth space from vessels carrying fertilizer, the throughput declines when the terminal is working more than one vessel. The average handling rate for unloading wheat from bulk carriers is about 4,000 tonnes per day, which implies a ship turnaround time of 10 to 12 days, depending on the size of the bulk carrier. As a result, there is congestion during peak times for unloading bulk materials (grains, fertilizer, sugar and cement). This creates a significant demurrage cost. Moving the grain into Ethiopia would reduce this factor

Cargo undergoes pre-shipment inspection before loading and is inspected and cleared by the Ethiopian Conformity Assessment Enterprise while still on the vessel. Separate declarations are then issued for each truckload indicating the delivery destination.

3.2.2 Preliminary Business Model: Grain Handling at Modjo

Opportunity: The grain exporters are using mostly ships carrying 50,000 tonnes, although there is discussion of using ships soon that carry 70,000 tonnes of cargo. Now that the railway is operational, bulk shipments to Modjo for bagging and distribution from Modjo could reduce the cost and time of delivering grain to flour mills as well as enhancing the timely delivery of flour to consumers. It would also incur more of grain imports, handling and distribution costs in Ethiopian birr rather than in U.S dollars and create more jobs in Ethiopia.

Priority: Delivery of grain to the market to stabilize prices and address shortfalls in the most basic commodity for human survival is critical.

Criteria for Success: Improved and efficient port operations and railway loading to reduce demurrage costs for excessive ship turnaround times. Develop handling, bagging, storage and delivery systems at Modjo that provide grain at lower costs and with greater reliability.

Proposed System:

- The Ministry of Finance would continue to determine demand and tenders. Automated systems would be developed to plan and monitor shipments, handling and distribution.
- On ship's arrival in Djibouti, the grain will be tested on the ship for quality and quantity by the Ethiopian Conformity Assessment Enterprise. The test allows the transfer of responsibility for the goods to ETBC. Testing by other agencies can be carried out at Modjo.
- Grain would then be loaded into rail wagons for the transfer to Modjo. At present, the rail line does not go to the DMP terminal. The link is planned for

completion and would probably be available by the time of implementation of this bulk handling system. The transfer to rail would be similar to that described above. Ships carrying 25,000 metric tonnes can use SDTV which has an efficient system for grain. Where the conveyor and silo system is being transferred from fertilizer to grain or vice versa it must be thoroughly cleaned and certified for safety.

- At Modjo, the grain would be transferred from the rail wagons to silos. The total silo capacity should be 100,000 tonnes, the volume of two shiploads.
- Instead of bagging at the port, bagging would be carried out at Modjo and the bags put into warehouses for delivery to the regional and local warehouses. ETBC would arrange the shipments from Modjo Dry Port to their warehouses using their own trucks and tendering, if necessary.

Time, Cost and Reliability

The transition to Modjo and the location of warehouses served is similar to that for fertilizer and the time, cost and reliability factors will be similar. It should be noted that some of grain imports are done annually, while the rest respond to situations that arise based on drought and shortages. Therefore it is necessary to have a system that is flexible and capable of rapid response to conditions and the presence of several donor agencies that will need to be coordinated. Due to the volumes, some grain warehouse locations will need to be delivered directly from the port, while others can best be delivered via Modjo (probably Oromia and SNNPR).

The following table illustrates the regional warehouses for delivery of grain by ETBC. Each is a transport node for further distribution into the region. There are about 250 final distribution points.

Table 33: Wheat Distribution by Centres for 2018-2019

R. No	Distribution Center	Distribution Per month	Quota/Qtl For 6 months	Actual Distribution for 6 months	Transportation Cost/Qtl from Djiboutiin Birr
1	Addis Abeba	253,992.00	1,523,952.00	167,040.00	125
2	Naziret	98,500.00	591,000.00	1,670,681.00	110
3	Mekele	82,417.00	494,502.00	329,985.00	110
4	Dessie	36,800.00	220,800.00	305,772.00	88
5	Shashemenie	80,234.00	481,404.00	67,405.00	135
6	Diredewa	20,127.00	120,762.00	201,027.00	85
7	Harerie	18,145.00	108,870.00	0.00	98
8	Bahirdar	52,279.00	313,674.00	110,354.00	134
	Total	**642,494.00**	**3,854,964.00**	**2,852,264.00**	

Source: Belay Mekonnen, Marketing Directorate, Ethiopian Trading Business Corporation, 2019

Note: Volumes are in quintal.

Wheat is distributed year round making it easier to plan and staff. It can be noted that Addis Ababa is the largest distribution centre for the system. It can also be observed that the quotas are planned for twice a year, but the actual distribution varies considerably presumably based on local production and the need for price stabilization. Therefore the operations would need to have considerable flexibility built into it. The transports costs are fairly similar to fertilizer although generally a little bit higher. Savings would need to be sought with the railway operation. It is assumed there would be two bulk trains a day one for grain and one for fertilizer delivering from a dedicated track into the two bulk terminals.

Ensuring Reliability

- Planning and tracking software to monitor and integrate maritime and surface transport and procedures for planning and coordination
- Cycling deliveries from Modjo will be easier and have fewer cost implications

Recommendations and Action Plan:

1. Monitor planning and timing for the rail connection to the DMP and the efficiency of the off-take proposed.
2. Plan for the extension of the rail line into the Logistics Hub and the operational plans, positioning of the silos and warehouse and plan for bagging and blowing machinery. Determine the advantage of bagging for storage in the warehouse or of bagging on pickup to avoid double handling. Plan the road system in the Logistics Hub for pickup of grain by delivery trucks. Determine need for parking and other factors affecting the smooth flow through the facility and gate system.
3. Negotiate volume rates with the railway and road transporters based on high volumes throughout the year.
4. Design handling and distribution based on Modjo. The scheduling of delivery flows from the grain terminal will be critical to avoid congestions and delays in trucks entering the terminal and leaving loaded.
5. Implement and fine-tune the system. Evaluate for continuous improvement.

3.3 Business Model for Containerizing Coffee Exports at Modjo

3.3.1 Financial, Regulatory, Institutional and Procedural Considerations

Ethiopia's leading export is coffee. Ethiopia has increased export volumes, but consumption domestically has also increased. The following table illustrates coffee production for the past 5 years. The export amount is a matter of record. Because a considerable part of the coffee is grown in households, the domestic consumption is more of an estimate, meaning that total production is also an estimate.

Table 34: Overview of Annual Coffee Production

Year	Production (tonnes, '000)	Export Totals (tonnes, '000)	Domestic Consumption (tonnes, '000)
2013/14 (July 7–July 6)	404	191	213
2014/15 (July 7–July 6)	386	184	202
2015/16 (July 7–July 6)	328	199	129
2016/17 (July 7–July 6)	369	225	150
2017/18 (July 7–July 6)	400	238	162

Source: Ethiopian Coffee Exporters Association

The goal of the Second Growth and Transformation Plan is to increase coffee production from the base of 548,200 tonnes in 2014/15[26] to 1,102,600 tonnes by 2019/20. Coffee is primarily grown in small holdings in the west and southwest of the country. It is purchased by collectors or processors at the farm gate or carried to marketing centres established by the Government. Wet processing is done at coffee stations, and sun-dried cherries are delivered to mills where they are hulled and bagged. Wet processing yields a higher quality product, but is limited by the number of coffee stations. Most coffee is sold green. Exporters operate warehouses where they clean, remove foreign material from the beans and bag them in 60 kg bags for export. Most exporters buy coffee from the Ethiopia Commodity Exchange which traces coffee to the region in which it is produced. Increasingly, buyers want traceability to the village or individual farmer level. Some producers are selling directly to the niche markets demanding that traceability and offering higher prices. The Ethiopian Coffee Authority has a division working with these farmers.

[26] The difference in totals for 2014/15 is probably caused by varied estimates of production for domestic production.

Most exporters who sell to overseas buyers are located near Addis Ababa. Previously, most exporters claimed it was hard to obtain containers in Addis Ababa, despite the fact that the imbalance in trade means the majority of containers return to Djibouti empty. As a result, they transported the coffee in bags to Djibouti where the bags were stuffed into containers for shipment. Coffee is sold FOB under an irrevocable letter of credit. Exporters have a preference for containerizing in Ethiopia where they would have greater control of the process and delivery timetable and recently the situation has changed and about 50% - 70% of coffee exports are containerized in Addis Ababa[27]. In the latter part of 2018, there was a security problem with coffee being stolen not only from loose bags in trucks, but also from containers during the road transport to Djibouti and causing some customers to receive orders that are incomplete thereby affecting Ethiopia's reputation and the exporter's. As a result, exporters have expressed interest in using rail, which is known to be more secure.

3.3.2 Preliminary Business Model: Coffee Processing and Consolidation through Modjo

Opportunity: About 30 - 50% of coffee exporters are shipping to Djibouti in bags to be containerized at the port. This means some exporters are not involved in the final stages of their export and cannot guarantee that the entire shipment was sent and that nominated ships aren't missed. If exports could be containerized and all regulatory procedures handled in Ethiopia so that the container is transported directly to the stacks, the exporters would be assured that their product is being sent to the buyer intactas contracted. All of the exporters are concerned with loses along the road route and would be more confident with rail transport from Modjo. It will benefit the GOE in that the costs related to containerization will be incurred in Ethiopian birr rather than in U.S dollars and that jobs will be created in Ethiopia. and eExporters who dowill not have to go through the paperwork and delays to get foreign exchange to pay for costs incurred in Djibouti.

Priority: Delivery of coffee containers reliably for shipment with costs incurred mostly in Birr rather than USD.

Criteria for Success: Developing an efficient model for moving containers from the multimodal import area to the export area to be cleaned and stuffed in the Green

[27]This change was verified with the Coffee Liquorization Unit, which tests all bagged and containerized coffee for approval to export. More recently, the consultant was told by members of the Ethiopian Coffee Exporters Association that the amount containerized in Ethiopia is less that first indicated. If it is closer to 50%, there is a significant number of exporters potentially interested in using Modjo.

Logistics Hub. The criteria for attracting coffee exporters to Modjo are security, speed, reliability and low cost.

Proposed System:

- Emptied import containers would be transferred efficiently according to demand to the export area for cleaning, and stuffing with exports. Attention would be given to identifying containers of the shipping company nominated by the buyer. One module of the terminal operating system (TOS) should be dedicated to handling empties and identifying containers needed for export with the flow of empty containers through Modjo. The container identification, cleaning and preparation for stuffing services could be tendered to a private sector logistics company.
- Forwarders, whether ESLSE or private, would also facilitate all the necessary inspections and documentation, so that containers leaving Modjo can be placed directly in the stacks for the Container Terminal in Djibouti.
- The exporter will need an export permit from his bank, a quality certificate from the Coffee Liquorization Unit and customs inspection. Any regulatory agencies required for carrying out an inspection or final authorisation before sealing the container should maintain staff at the export facility of Modjo to carry out these responsibilities. The Coffee Liquorization Unit (CLU) has laboratories in Addis Ababa with considerable equipment for testing that they use for grading and certifying the quality of all coffee that is exported. Most coffee exporters are located in the Jacros area of Addis Ababa along with CLU and a Customs office. CLU generally goes to the exporter to take the sample for testing and bring it back to their laboratory for testing and preparing the certificate. The main laboratory is needed in its current location because some coffee will continue to be processed in Addis Ababa through the many warehouses located there and shipped directly. CLU would be interested in having an additional laboratory and examiners at Modjo to grade and certify quality of all coffee being shipped from Modjo. Alternatively, CLU would place an examiner at Modjo to verify that all coffee being exported has been fully certified and properly packed in Jacros and is in the same condition as tested. According to the Customs Commission, all agencies involved in inspections do it jointly. Therefore an efficient one stop shop for users is created, but also the work of regulators is consolidated in one area for their efficiency.
- Coffee is generally stored and transported in 60 kg bags. Coffee is shipped according to the specification of the shipper. Much of the coffee is shipped in 60 kg bags placed in containers. Depending on the contract, the bags may be placed on a pallet and kraft paper or plastic membranes may be used for packing

inside the container. Large commercial customers generally request coffee to be shipped as bulk inside the container which they offload directly into their silos on arrival. Blowers are used for loading coffee as bulk into the container. They are generally not used in the bagging process. Blowers and these supplies must always be available for the coffee exporting operations.

- Once done, the container will be sealed by the Customs Commission for shipment by rail or alternatively by truck.
- The Djiboutian transitaire partner at the port will ensure that all documentary requirements are met and that the containers are loaded into the stacks in time and into the ship. If the trade could be FOB Modjo, then the exporter would control the process until the coffee is the hands of the shipping line, which would be preferable for the exporter.
- Coffee is a significant valuable product for Ethiopia and the exporter will appreciate being able to guarantee the quality and quantity of the product being shipped as long as possible. It will be important that delivery of coffee and the process of regulation and containerization is fast and the coffee does not wait long before handling or in waiting for the train or at the seaport. Coffee is not fumigated in Ethiopia which means that it should be shipped to the customer as efficiently as possible to avoid any spoilage. The physical organization of the process must minimize handling charges and delays within the terminal.

Value-added:

If coffee is being sold directly to a retailer, it can be packaged, labelled or meet any other requirements for going directly into the overseas market. Ethiopia has a real opportunity to brand its coffee with colourful, artistic packaging that depicts the growing of coffee in its country of origin with traceability back to the village from which it was produced, as well as identification with the rich history and culture of the Ethiopia. An example of this kind of branding is the depiction of "Juan Valdez" as the friendly Colombian coffee grower on every package and TV ad for a decade. It identified Colombia as the country to buy coffee from. The export centre of Modjo should seek new supply chain solutions for exporters seeking new marketing channels to international retailers. Part of the coffee facility should have space for coffee roasting and filling small packages of coffee for retail operators and cafes rather than the 60 kg bags of green coffee being shipped to most customers. The Ethiopian Coffee Authority has a unit dedicated to working with growers seeking to use this value-added approach.

Benefit to the Exporter:

1. Housing all inspections and certifications at Modjo, will save time, cost and hassle.
2. Modjo must be a well-managed node in a smooth supply chain from Addis Ababa to the oversea markets.
3. Using the railway will increase security during logistics and transport operations and reduce cost.

Time, Cost and Reliability

Table 35: Estimated time comparison of current and proposed Coffee Export System

Current Systems					Proposed System	
Cargo Flow	**Containerizing in Djibouti**	**Hours**	**Containerizing in Addis Ababa**	**Hours**	**Proposed System**	**Hours**
Road Transport to Djibouti	Load bags into truck for transport to Djibouti	48 hours			Load bags into truck for transfer to Modjo	6 hr
Regulatory clearance	Addis and Kality	12 hr	Regulatory clearances	12 hr	Modjo	6 hr
Obtain 20' container, stuff in container, and seal.	Djibouti	96	Addis Ababa Warehouse	72 hr	In Modjo	60
Transport to Djibouti			Road Transport to Djibouti	48 hr	Railway to Djibouti	10 hrs
Place 20' container in stack	Djibouti	12	Djibouti	12	Djibouti	12
Total:	60 hrs+**108=**	**168**	**132 hrs +** 12	**144**	**82** + 12=	**94**

Source: Consultant's estimate based on interviews and rate schedules for Ethio-Djibouti Railway and the Port.

Table 36: Cost Estimate for Current and Proposed Coffee Export System

Current Systems					Proposed System	
Cost to End User	Containerizing in Djibouti	Birr/ USD	Containerizing in Addis Ababa	Birr/ USD	Proposed System	Birr/ USD
Transport charges	Road transport to Djibouti	35,000Br			Road transport to Modjo	6,400Br
Dry Port handling charges			Container movement	6400 Br	Dues, handling and container movement	2392Br
Regulatory charges	Customs, CLU, etc.	$100	Customs, CLU, etc	1500 Br	Customs, CLU, etc.	1500 Br
Obtain and stuff 20' container.		$100	Obtain and load in container	1500 Br	Container preparation and stuffing	1130 Br
Sealing		$60	Seal and load on truck	1200 Br	Seal and move to rail stacks	1500Br
			Road Transport to Djibouti	35,000 Br	Rail transport to Djibouti	10,343Br
Forwarding in Djibouti		$100	Djibouti	$70	Documentation in Djibouti	$70
Port dues		$21.15	Port dues	21.15	Port dues	$21.15
Total		35,000Br $381.15	Total	45,600 91.15	Total	23,265Br $91.15

Source: Consultant's estimate based on interviews and rate schedules for Ethio-Djibouti Railway and the Port. / Note: Items in red at Djibouti, in black in Ethiopia.

These tables are intended to be indicative of variables of time and cost and the currency in which costs are incurred. The dry port will need to review their container fee structure and costs to be incurred for new customers, such as exporters. Railway costs are based on their current stated structure but would need to be negotiated on the basis of regular, high volume traffic. As a rule of thumb, rail should be about 20 percent below road transport since it is generally not door to door and requires truck transfer to and from the terminal.

Ensuring Reliability

- Regulatory and container handling procedures are all done in one facility in Ethiopia under control of the exporter's clearing agent.
- Modjo will need good software to plan and record in real time the location of containers. Empties will need to be monitored for export requirements and for repair and cleaning. Loading of exports on the train will need to be efficient to maintain coffee quality.
- Forwarders will need an agent in Djibouti to handle document processing with the shipping line and to monitor loading into the stacks and departure.

Recommendations and Action Plan:

1. Determine regulatory controls done in Addis Ababa and those to be done at Modjo. Agree on export facility requirements for inspections. Construct an office adjacent to the coffee warehouse for use of regulatory officers, including a laboratory and office for CLU
2. Plan arrangement at existing rail terminal sidings for efficient offloading to the import container area and arrangement of stacks for loading of export containers at Modjo. Monitor efficiency of rail operations for export.
3. Ensure that the Rail Mounted Gantry (RMG) is operating correctly. Note the volumes that would trigger procurement of additional RMGs.
4. Procure software for container handling at Modjo and for transfer from import to export stacks as needed.
5. Plan the road system in the Logistics Hub for delivering commodities to be processed for export and pickup of containers if some are to move by road.
6. Negotiate volume rates with the railway and road transporters based on estimated volumes throughout the year.
7. Implement and fine-tune the system. Evaluate for continuous improvement.

3.4 Business Model for Containerizing Sesame Exports at Modjo

3.4.1 Financial, Regulatory, Institutional and Procedural Considerations

Sesame is one of Ethiopia's leading exports – second in 2017 after coffee in value. Unlike coffee it is grown almost exclusively for export. Total production in the last year was 350,000 metric tonnes of which at least 95% was for export. The goal of the Second Growth and Transformation Plan is to increase oil seed productivity from the base of 9 quintals per hectare in 2014/15 to 12.7 quintals per hectare by 2019/20. It is given high priority by GOE for increasing Ethiopia's exports in the global market.

Sesame is primarily grown by smallholders in the northwest and central west of the country. More than 750,000 farmers grow sesame on an average of half a hectare of land each. It is a rain-fed crop and grows well in arid and semi-arid environments. It is planted in June to mid-July and harvested in mid-October to November. It is purchased by collectors at the farm gate and sold to mills throughout the growing region for drying and using an air separation process to remove foreign particles. A purity level of 95% is achieved. Sesame can be stored up to 24 months after cleaning, but the moisture content must remain at 6% or less. Sesame is sold through the Ethiopian Commodity Exchange (ECX) in Addis Ababa and the product is stored in 50 kg bags in ECX warehouses around the growing area and Addis Ababa.

Most exporters buy sesame on the ECX and operate processing plants both in Addis Ababa and in the northwest and central west for doing the grading according to variety, color and purity. Some of the sesame produced in the northwest is exported through Port Sudan, but most of it is transported to Djibouti. Consultation with exporters indicated that while there is some pilferage of sesame in Djibouti, it is a much larger problem in Port Sudan at present. Therefore sesame mostly goes through Djibouti. It is transported in 50kg bags and containerized at the shipping line facilities. The regulatory process includes inspection by Customs, by SGS or another pre-shipment firm nominated by the buyer, by the Ministry of Agriculture for SPS standards and fumigation, which is done by placing tablets between the bags, and by Ministry of Trade and Industry for checking quality and compliance with national standards for sesame. In Djibouti, the bags are stuffed into containers for shipment by a Djiboutian company of behalf of the seller.

The problems faced by sesame exporters include:

- The fact that the seller does not see the way the product is sent and is counting on another firm to do verification for him. Sometimes the shipment is short by a

bag or two, which the seller does not realize until he receives a complaint from his buyer.
- The seller does not see the condition and cleanliness of the container the product is sent in. It is a food product that can be contaminated by the container.
- Transport costs are high.

As a result, exporters would be very interested in completing the process in Ethiopia so that the seller can ensure the quantity and condition of what is sent to his customer and to use rail transport which is known to be more secure and generally cheaper.

3.4.2 Preliminary Business Model: Sesame through Modjo

Opportunity: Most sesame exporters are shipping to Djibouti in bags to be containerized at the port. All of the exporters are concerned with loses and condition of the product on arrival to the buyer. Their business reputation is affected by actions they have insufficient control over. If exports could be containerized and all regulatory procedures handled in Ethiopia in a one stop clearance at Modjo so that the container is transported by rail directly to the stacks for the shipping line, the exporters would be extremely interested in using the system. The final criterion is cost. The preliminary evaluation of exporters consulted, is that for product being shipped from Addis Ababa or central west Ethiopia, this approach would be advantageous and cost competitive. For sesame being processed in the northwest, it would probably be too expensive to move through this process and the exporters would probably still send the product from Humera and Metema in bags directly to Djibouti for the final loading and containerization stages. For Gondar, a proven reliable system, might make Modjo advantageous.

Table 37: Choice of Port – Distance vs. Security

Origin	Destination	Distance (km)	Time (hrs)
Humera	Port Sudan	732	11
Humera	Djibouti	1305	18
Gondar	Port Sudan	1132	15
Gondar	Djibouti	950	16

Source: HPC/CDC 2018

This change will also benefit the GOE in that the costs related to containerization will be incurred in Ethiopian birr rather than in U.S dollars and that jobs will be created in Ethiopia.

Priority: Delivery of sesame containers from central Ethiopia reliably for shipment with costs incurred in Birr rather than USD.

Criteria for Success: Developing an efficient system for moving containers from the multimodal import area to the export area to be cleaned and stuffed in the Logistics Hub for export by rail to Djibouti for immediate placement in the stacks. The criteria would be security, speed, reliability and cost.

Proposed System:

- Emptied import containers would be transferred efficiently according to demand to the export area for cleaning, and stuffing with exports. Attention would be given to identifying containers to the shipping company nominated by the buyer. One module of the TOS should be dedicated to handing of empties and matching containers needed for export and to a system for rapid placement in the export cleaning and stuffing area. These services might be tendered to a private sector logistics company.
- Forwarders, whether ESLSE or private, would also facilitate all the necessary inspections and documentation, so that containers leaving Modjo can be placed directly in the stacks for the railway in Modjo and then for the Container Terminal in Djibouti.
- The regulatory process includes inspection by Customs, by SGS or another pre-shipment firm nominated by the buyer, by Ministry of Agriculture for SPS standards and fumigation, which is done by placing tablets between the bags, and by Ministry of Trade and Industry for checking quality and compliance with national standards for sesame export. Any regulatory agencies required to carry out an inspection or final authorisation before sealing the container should maintain staff at the export facility of Modjo to carry out these responsibilities. According to Ethiopian Customs Commission (formerly ERCA), all agencies involved in inspections do it jointly, which will be essential to the efficiency of Modjo. Therefore an efficient one stop shop for users is created, but also the work of regulators is consolidated in one area for their efficiency as well.
- Once done, the container will be sealed by the Ethiopian Customs Commission for placement in the stacks beside the rail spur for shipment by rail or alternatively loaded for shipment by truck. Turnaround time at Modjo will be critical for successful railway operations as well. The railway transfers the wagons for a shunting locomotive to the spur at the container terminal in Djibouti. Most delays for railways occur at the terminals and turnaround points.

The Djiboutian transitaire partner at the port will ensure that all documentary requirements are met and that the containers are loaded directly into the stacks for the nominated vessel in time.

Time, Cost and Reliability

Table 38: Time comparison of current and proposed system (Sesame)

Current Systems					Proposed System	
Cargo Flow	Containerizing in Djibouti	Hours	Containerizing in Addis Ababa	Hours	Proposed System	Hours
Road Transport to Djibouti	Load bags into truck for transport to Djibouti	48 hours			Load bags into truck for transfer to Modjo	6 hr
Regulatory clearance	Addis and Kality	12 hr	Regulatory clearances	12 hr	Modjo	6 hr
Prepare 20' container, stuff in container, and seal.	Djibouti	96	Addis Warehouse	72 hr	In Modjo	72
Transport to Djibouti			Road Transport to Djibouti	48 hr	Railway to Djibouti	10 hrs
Place 20' container in stack	Djibouti	12	Djibouti	12	Djibouti	12
Total:	60 hrs+108=	168	132 hrs + 12	144	82 + 12=	94

Source: Consultant's estimate based on exporter interviews. / **Note:** Items in red at Djibouti, in black in Ethiopia.

Table 39: Cost Comparison Estimate for Current and Proposed System for Sesame

Current Systems					Proposed System	
Cost to End User	Containerizing in Djibouti	Birr/ USD	Containerizing in Addis Ababa	Birr/ USD	Proposed System	Birr/ USD
Transport charges	Road transport to Djibouti	35,000Br			Road transport to Modjo	6,400Br
Dry Port handling charges			Container movement to warehouse	6400 Br	Dues, handling and container movement	2392Br
Regulatory charges	Customs, etc.	$100	Customs, CLU, etc	1500 Br	Customs, etc.	1500 Br
20' Container preparation and stuffing		$100	Obtain and load bags into container	1200 Br	Container preparation and stuffing	1130 Br
Sealing		$60	Seal and load on truck	1200 Br	Seal and move to stacks	1500Br
			Road Transport to Djibouti	35,000 Br	Rail transport to Djibouti	10,343Br
Forwarding in Djibouti		$90	Djibouti	$70	Documentation in Djibouti	$70
Port dues		$21.15	Port dues	21.15	Port dues	$21.15
Total		35,000Br $371.15	Total	45,300 91.15	Total	23,265Br $91.15

These tables are intended to be indicative of variables of time and cost and the currency in which costs are incurred. The table assumes sesame is from an Addis Ababa warehouse. If it is from farther away it would affect the first cost whichever method is used. The dry port will need to review their container fee structure and costs to be incurred for new customers such as exporters. Railway costs are based on their current stated structure but would need to be negotiated on the basis of regular, high volume traffic. As a rule of thumb rail should be about 20 percent below road transport.

Ensuring Reliability

- Regulatory and container handling procedures are all done in Ethiopia under control of exporter's clearing agent in one facility.
- Modjo will need good software to plan and record in real time the location of containers. Empties will need to be monitored for export requirements and movement of excess empties to the port to avoid dry port congestion and shipping line penalties.
- Forwarders will need an agent in Djibouti to monitor loading into the vessel stacks and departure.

Recommendations and Action Plan:

1. Agree on export facility requirements for inspections and fumigation and plan the coordination of them. Construct an adjacent office for use of regulatory officers and storing of any equipment and materials.
2. Plan stacking arrangements at existing rail terminal for efficient offloading and loading of export containers and positioning at Modjo.
3. Procure software for container handling at Modjo and for controlling transfer from import to export processing areas as needed.
4. Ensure that the Rail Mounted Gantry (RMG) is operating correctly. Note the volumes that would trigger the need for additional RMGs.
5. Plan the road system in the Logistics Hub for delivery of containers to Modjo and any movement within the export centre for processing and loading on the railway. Have a road plan for any containers being moved by truck rather than rail.
6. Negotiate volume rates with the railway and road transporters based on estimated volumes throughout the year.
7. Implement and fine-tune the system. Evaluate with users for continuous improvement.

3.5 Business Model for Cool Chain Development for Horticulture Products suitable for Sea Freight

The Model will be analysed for its application to horticulture, but also apply for other commodities requiring a cool or cold chain.

3.5.1 Financial, Regulatory, Institutional and Procedural Considerations

Production of perishable goods for domestic and export markets offers significant opportunities for Ethiopia. With its variation in altitude, almost all tropical, subtropical and temperate fruits and vegetables can be grown in the country. According to the Ethiopian Horticulture and Agricultural Investment Authority (EHAI), about 12,800 hectares suitable for horticulture is available for development. Only 11% of that available land has been developed. Ethiopia has capacity for significant growth if irrigation, rural access roads, agricultural inputs, extension, storage, cool chains, and marketing can be further developed.

GOE has given this important export sector top priority. Horticulture is seen as an important source of foreign currency and job creation. It established the Ethiopian Horticulture Development Agency in 2008 to provide domestic and foreign investors with incentives, such as access to land, investment assistance for greenhouses and packing houses and logistics improvements. Because of the potential, has set aside 6000 hectares of land for horticulture hubs at Alage, Arba Minch, Awassa and Bahir Dar. The Dutch have played a triple role in Ethiopian's agriculture growth as investors, end markets and donors. They have provided technology and investment to support the horticulture industry based on their understanding of Ethiopia's extensive natural resources and development potential.

Table 40: Export of Horticultural Produce (tonnes)

Year*	Fruit (tonnes)	Fruit (USD)	Vegetables (tonnes)	Vegetables (USD)	Total (tonnes)	Total (USD)
2011/12	12,859	4,400,603	110,678	40,539,765	123,447	44,940,369
2012/13	14,455	4,089,279	127,858	61,890,189	142,313	65,979,468
2013/14	17,912	5,717,778	131,148	41,238,648	149,060	46,956,426
2014/15	17,543	5,412,793	124,173	38,138,794	141,716	43,551,587
2015/16	18,020	5,791,054	145,245	43,504,991	163,265	49,296,045

Source: Ethiopian Horticulture Producers and Exporters' Association (EHPEA) *For statistics, the year is based on the fiscal year from July 7 to July 6 of the next year.

Twenty companies are involved in large scale and modern fruit production and 32 vegetable exporting farms in Ethiopia. These vegetable producing farms include a wide variety, including green beans, snow peas, tomatoes, paprika, eggplant, baby corn, onion and garlic. There are also six herb companies producing 21 varieties of herbs. These are generally exported by air freight, however.

Three regions have been targeted for expansion of international export: the European Union, Middle East, and regional markets in East Africa. This choice is based on Ethiopia's proximity to Europe, which accounts for 50 percent of the world's imported fruits and vegetables, and the Middle East, one of the fastest growing international horticulture markets. The export markets in the region are also included because of the increasing demand in the East African Community urban areas and the fact that most of Ethiopia's immediate neighbours are arid with limited capacity to produce fruits and vegetables themselves.

Ethiopia developed its cut flower export sector in 5 years to be the second largest producer and exporter after Kenya in Africa. It has 84 active flower farms. Ethiopian Air Cargo developed a sophisticated cool chain system for flower exports and operates two 747 cargo planes each night to Liege for the Amsterdam flower auction and direct delivery to other countries. It is understood it also operates direct air cargo service for flowers from Bahir Dar, a recent development. In addition, flowers are carried as belly cargo to other destinations. Some fruit and vegetables are being airfreighted to Europe and the Gulf states. This can be done for specialty products that draw high prices, however, to expand substantially in fruit and vegetables, efficient sea freight systems should be developed with Europe and the Middle East based on proximity. The region

between Modjo and Awassa offers considerable opportunity for development of horticulture and will be served by a new highway being built between the two.

The problems faced by fruit and vegetable exporters include:

- High cost of transport from Ethiopia
- Lack of reefer containers inland to export by sea freight; lack of sufficient cool chain systems for surface transport
- Challenge of penetrating new horticulture markets

The European Union is the largest importer of fruits and vegetables worldwide. As a result, it is a highly competitive market and not easy for a newcomer to penetrate. A few large importing companies dominate. Most trade takes place on the basis of large scale supply contracts with the leading wholesalers or the large supermarket retail chains, such as Tesco in the UK and Aldi in Germany.

The entry barriers for new suppliers are high because quality and food safety controls and certifications are stringent. Large importers are likely to cancel contracts for delays, order mistakes and not meeting packing specifications. Given the high level of concentration in the European fresh food market sector at the level of the retail chains, the bargaining power of suppliers is limited. The following strategies for entering the EU market can be pursued:

- Link with a current supplier of European retailers
- Remove all risks for the retail chains throughout production and postharvest handling
- Prove that changing suppliers will be price neutral or better
- Small scale growers must provide consistent volumes of reliable quality
- Establish a reputation for carbon reduction and/or fair trade.

Existing Ethiopian producer/exporters, such as Jittu and Joytech, are well linked to the European import market, either through strategic alliances or based on ownership structure. European importers want to serve customers with year-round produce at competitive prices and of outstanding quality. Ethiopian exporters have opportunities, especially in terms of supply windows (seasonality advantages) or price/quality competitiveness.

With an annual growth of nearly 3%, the fruit market in the Middle East is one of the fastest growing fresh produce markets in the world. The vegetable sector also offers significant opportunities. Despite good growth prospects, the Middle East has appeared to be fragile and sensitive to macro-economic turmoil. At the same time, the situation of

unrest in the Middle East, especially Egypt, Syria, and Lebanon, which are major competitors to Ethiopia, could benefit Ethiopian suppliers to the region.

The food chains are becoming much more sophisticated in Saudi Arabia and other Gulf states. At the same time, the traditional wholesaler/importer still occupies a large share of the market. Food expenditures are growing rapidly in the Middle East. Quality and safety standards are not as stringent as in Europe, but are substantial.

The East African market has been the fastest growing in Sub Saharan Africa. The rapidly growing urban areas offer a market with the affluence to diversify eating habits. East African juice producers typically import their juice concentrate. It is a market Ethiopia could cultivate. Ethiopia can promote regional specialization and develop economies of scale to compete with other exporters to the region. Southern Ethiopia is well positioned to use the improved road through Moyale border post to Nairobi and the Northern Corridor to connect to other East African cities. Central Ethiopia may be able to develop sea freight operations through Djibouti to Kenya and Tanzania.

3.5.2 Preliminary Business Model: Cool Chain Facilities from Modjo to Market

Opportunity: Ethiopia has an excellent environment for producing a wide variety of fresh fruit and vegetables for export by air or sea freight. Proximity to Europe, the Middle East, the East African Community and the neighbouring arid countries of Djibouti, Somalia and Sudan all offer opportunities.

Priority: Delivery of horticulture produce from central Ethiopia to Europe, the Middle East and regional markets in good condition at competitive prices with as much of the logistics costs as possible incurred in Birr rather than USD.

Criteria for Success: Developing groups of local producers capable of delivering consistent quality in sufficient quantity at a favourable price. To bring the price down it will be necessary to promote more imports requiring cool chain systems, so that refer containers can be used on both import and export legs of the transport and thereby limiting the cost of bringing reefer containers inland. A complete supply chain will need to be developed so that produce is maintained at common temperatures for the duration of the transit according to the requirements of each product.

Proposed System:

- Farmers within a 60 - 100 km radius of Modjo will be informed of market studies, encouraged to produce for the export market and trained in the

requirements of these markets. Imports requiring reefer containers will be identified and fostered to control the transport cost for perishable goods by sea freight.

- A facility for trimming, washing, packing and chilling will be established at the dry port export section. A determination will be made of what can be built as part of the project and what will require private sector or outside investment.
- Forwarders, whether ESLSE or private, would also facilitate all the necessary inspections and documentation, so that containers leaving Modjo can be placed directly in the stacks for the railway in Modjo and then in refer stacks for the Container Terminal in Djibouti.
- The regulatory process includes inspection by Customs, by SGS or other pre-shipment firm nominated by the buyer, by Ministry of Agriculture for SPS standards and fumigation, which is done by placing tablets between the bags, and by Ministry of Trade and Industry for quality and compliance with national standards for horticulture produce. Any regulatory agencies required to carry out an inspection or final authorisation before sealing the container should maintain staff at the export facility of Modjo to carry out these responsibilities. According to ECC, all agencies involved in inspections do it jointly which will be essential to the efficiency of Modjo. Therefore an efficient one stop shop for users is created, but also the work of regulators is consolidated in one area for their efficiency as well.
- For cargo that is going to be shipped in cartons or palletized, the railway has refrigerated wagons that can be used. For cargo that is going to be shipped in reefer containers that can be transferred to the vessel stacks and then directly onto the ship, the reefer container will need to be shipped to Modjo loaded with imports, destuffed, cleaned and loaded with vegetable and or fruit products. The product and each container must be chilled to the temperature appropriate to each product. Once regulatory procedures are done, the container will be sealed by ECC for placement in the stacks beside the rail spur for shipment by rail or alternatively loaded for shipment by truck. Putting product into reefer container stacks must be timed to be close to the time of loading. Electricity outlets on the train will be necessary to maintain the cool chain throughout the transit process.
- Turnaround time at Modjo will be critical for successful railway operations as well. At Djibouti, the railway transfers the wagons by a shunting locomotive to the spur at the container terminal. Most delays for railways occur at the terminals and turnaround points.
- The Djiboutian transitaire partner at the port will ensure that all Djibouti documentary requirements are met and that the containers are loaded directly into the reefer stacks for the nominated vessel in time.

Time, Cost and Reliability

This is a new opportunity for the horticulture sector. Discussion with the industry suggests that companies in the perishable vegetable/fruit area are producing high value, niche products that can incur air freight charges. Ethiopia has many other high quality fruit and vegetable products that can be developed commercially if a sea freight alternative can be developed. Ethiopia has considerable expertise it has developed in rapidly and successfully competing in the international flower business. This initiative for fruit and vegetables should be developed using Ethiopian expertise in the horticulture sector and in cool chain systems at the Ethiopian Air Cargo Company. It should also be open to international participation with knowledge of the Middle Eastern market and operations there. Any tender process should involve bidders in estimations of demand, operating systems and a preliminary business plan for use of the Modjo cool chain facility. Since it is likely to involve participation by small grower schemes, Ethiopian government programs to strengthen this sector should also be involved in the design and financial aspects of small holder systems.

Ensuring Reliability

- Regulatory and container handling procedures are all done in Ethiopia under control of exporter's clearing agent in one facility.
- Modjo will need good software to plan and record in real time the location of reefer containers. Empties will need to be monitored for export requirements and rapid turnaround.
- Coordination of timing of import reefer container cleaning, loading and maintaining appropriate temperature for each product.
- Forwarders will need a forwarding agent in Djibouti to monitor loading into the vessel stacks and departure while maintaining the cool chain.

Recommendations and Action Plan:

1. Review market opportunities for horticulture exports using sea freight.
2. Identify potential partners in the European Union and Middle East that can handle sales and logistics there.
3. Determine products to develop and their handing and transport requirements.
4. Agree on export facility requirements for inspections and fumigation and plan the coordination of them. Construct an adjacent shared office for use of regulatory officers and storing of any equipment and materials.
5. Plan the process for each identified product and develop an annual schedule for the facility based on seasonal requirements.

6. Procure software for reefer container handling at Modjo and for rapid transfer from import to export processing areas and loading product on conveyance for transit.
7. Plan reefer stacking arrangements at existing rail terminal for efficient offloading and on-loading of containers and positioning at Modjo. Plan rail offloading and on-loading of cartons or palletized cargo on refrigerated wagons.
8. Plan the road system in the Logistics Hub for delivery of fresh produce to the horticulture facility at Modjo and any movement within the export centre for processing and loading on the railway. Have a road plan for any containers being moved by cooled truck to destination.
9. Negotiate volume rates with the railway and road transporters for refrigerated wagons and reefer containers based on estimated volumes throughout the year.
10. Implement and fine-tune the system. Evaluate with users for continuous improvement.

4. DETERMINATION OF GREEN LOGISTICS HUB REQUIREMENTS

The demand analysis suggests specific types of activities and commodities to be served in MGLH. The requirements have been further defined in consultation with the industries during the market surveys in November and December in 2018 and also February 2019. First, the projections clearly indicate increasing demand for handling import containers. Meeting the requirements will require increased efficiency in the existing facility as well as allocation of additional space within the MGLH. Second, there is demand for serving exports at Modjo if systems can be developed which expedite the process of regulatory procedures, container preparation and stuffing and exporting by rail. Third, a cool chain facility for perishable horticulture products (fruits and vegetables) as well as medicine and other commodities requiring a cool chain.. Fourth, development of intermodal systems for importing bulk products, such as fertilizer and grain, by rail for bagging and distribution by truck to zonal warehouses. Consideration has also been given to handling of steel and steel products, heavy equipment, other project cargo and Ro-Ro. A description of the services and their requirements follows.

On the basis of the traffic forecast, the capacity requirements of the future MGLH have been determined. These capacity requirements determinations include the assumptions, but are not limited to area requirements, of improved systems for handling of goods and yard operations, handling productivity, etc. For the development of this task the Consultant used a methodology already proven in a multitude of similar feasibility studies carried out around the world. Based on data received in terms of traffic forecasts and commodity related demand, a detailed requirements and capacity plan is discussed below[28].

4.1 Container Facility

This chapter focuses on the current status of handling of containerized imports at Modjo Dry Port. Within the scope of a process mapping, key import cargo flows will be analysed as well as current commodity related supply chains. The current status analysis serves as a basis for developing future supply chain processes and capacities.

[28] Related equations are exemplarily shown in Annex 2 and explanations of used parameters are attached as Annex 3.

The Modjo Dry Port is currently used for handling import cargo and the related customs clearance procedures exclusively. In 2018, 130,747 full import TEUs were handled at Modjo Dry Port. There are loading and unloading operations of import containers, but no consolidation of export cargo and stuffing of containers. There are also areas that were originally allocated to be used for other cargoes like break bulk and RoRo but as experienced during several visits on site, they are all utilized by containers (empty and full).

The current process is as follows: A truck, coming from Djibouti and bringing a full container, arrives at the main gate and the driver hands over paperwork for review. The container is inspected for damage and the documents are transferred to customs. Currently, it appears that the distance between the parked truck and the customs office is quite far and the truck driver has to cover the distance by walking. In the end it takes quite a long time to hand over documents to customs. After completion of this procedure, a location in the stack is determined, and the truck driver proceeds to it. The operation of unloading the container from the chassis is done by a reach stacker. Currently there are six reach stackers operating and another ten new ones are supposed to operate at Modjo very soon[29]. The customs officers are available through a 14 hours window at the gate which exceeds the regular customs working hours of 8 hours.

Figure 18: Current Container Yard Operations

Source: HPC 2018

[29] Information gathered verbally during an on-site visit at Modjo on 17th Nov. 2018.

An empty truck which is supposed to pick up a full container also enters the dry port at the main gate. Before receiving the full container, the truck is supposed to proceed to the parking area. The driver completes the paperwork and waits until the container is located. The truck then enters the storage area, waits while the container is removed from the stack and is loaded onto the truck, and then leaves the terminal through the exit gate after having presented the gate pass. Afterwards the truck proceeds to deliver the container to its final destination. ESLSE is currently operating 450 own trucks.

Truck dwell time at Modjo Dry Port has been stated by terminal management being two hours per truck in average. There are regulations which determine that after exceeding five to six hours of truck dwell time on the terminal a detention fee applies charged by the truckers to ESLSE.

There is a three shift system at Modjo Dry Port. The first shift is from 06:00 a.m. to 02:00 p.m., the second shift is from 02:00 p.m. to 10:00 p.m. The third shift is from 10:00 p.m. to 06:00 a.m. (of the next day). Trucks are not handled during the third shift. The third shift, also called night shift, is used for shifting of containers. A quantity between 700 and 1,000 containers is shifted every night.

Except for the customs clearance all other services are provided by ESLSE. ESLSE is in charge of all incurring terminal operations such as loading and unloading of trucks and trains by reach stacker or gantry crane. During the consultants' visit a high number of workers were present at the dry port being either directly involved in terminal operations or available on demand. According to the Dry Port Director, currently 500 workers are employed on fulltime basis.

Figure19: Current Container Stripping Procedure at Modjo Dry Port

Source: HPC 2018

The above figure was taken during a visit at Modjo and shows terminal staff unloading a container for customs inspection. There is a large number of people working on this operation.

There are a number of factors affecting performance, some physical, ICT, financial, regulatory and behavioural. Both port management and regulatory agencies currently operate in temporary buildings. Nevertheless, the current arrangement allows good counter space for drivers and cargo owners to effectively queue for services. The security of the facility as a bonded warehouse is poor. A new administrative building is under construction for port administration, customs and other regulatory agencies working at Modjo, security officers, etc. The location is close to the gate, but far from many of the port operations. Equipment is frequently in short supply, which is presumably a budget issue and also a maintenance issue. This can cause extensive delays for truck drivers in having containers off loaded into the stacks or in picking up containers from the stacks to deliver to final destination. It is also an issue for Customs which must wait until there is a reach stacker available to move containers to the area dedicated to inspections.

An ICT terminal operating system have been developed by ESLSE. Until now, it does not provide real time information for efficient operations. Instead it requires data entry after containers are placed in the stacks. Systems are needed that are linked to devices that can enter all container data and location simultaneously with placement in the stacks. Systems need to track steps in the clearance process for each container so that delays can be identified and addressed. The process of preparing letters of credit for buyers and obtaining foreign exchange are time consuming and readily lead to delays in the import process.

The regulatory process also can be time consuming and necessitate numerous trips in Addis Ababa to obtain certificates, deliver documents or make payments. Finally, while some customers want their goods to be cleared quickly, others leave their goods at Modjo until they are sold and then collect them. As long as the storage rates are moderate, they may leave their containers for two to three months. In fact, some containers at Modjo have been there for several years and may never be collected. Customs can set penalties for late collection of goods or auction them after 60 days. According to interviews with customs since many imports are for government agencies, they do not charge penalties. The 60 day policy needs to be enforced. The issue of storage will need to be addressed in the new operation. According to ESLSE, average container dwell time at Modjo is now about 60 days. Empty containers also tend to accumulate at Modjo and add to the congestion. It will be critical that they are tracked

by shipping lines so that containers needed for the exporters are transferred to the export operations and that other empty containers are returned to the shipping lines in Djibouti.

Customs needs to implement its incentive programs more fully, so it does not cause excess dwell time. A major additional factor in excessive dwell time is the tendency of Customs to inspect more cargo than is necessary. Customs has a fully implemented risk management program module in ASYCUDA. Based on parameters entered by Customs into its ASYCUDA system, Customs can readily identify those commodities that need to be inspected and those that pose a minimal risk of revenue losses. Customs can update the risk profiles, when it recognizes offenders or types of duty evasion. Customs can also make greater use of scanners for a quick check to determine is a physical inspection is necessary. Customs needs to reduce its physical inspections from 40% to 20% through its use of its risk management system. Customs has a number of compliance incentive programs that should be used more fully. One is the Authorized Economic Operator Programme. Companies that have a good record of paying duties, are allowed an executed clearance with agreement with an agreement that they will open their books for post clearance audit on regular intervals, such as monthly. These measures can play a major role in reducing dwell time at Modjo.

Customs coordination with the other regulatory agencies for a smooth one stop operation will be critical to success of the export operation. Customs improvements will also be critical to achieving container handling targets for speed and service.

Requirements for improved container operations:

Physical

The project needs to ensure that there is sufficient handling equipment. When Modjo was built it was assumed that RTGs would be used for more efficient operations. For the future development of MGLH the consulting engineers are considering reach stacker operations on the existing container area and implementation of strengthened pavement on the extension area for RTG operations.. The ability to stack 6 high would make a major difference in the space efficiency of the container yard. The consulting engineers are considering the pavement and reinforcement necessary to enable full use of RTGs in the new container area for efficiency and greater capacity.

ICT

There are many software applications for dry port operations. It will be critical that these are fully explored for achieving full visibility of operations and efficiency. Adequate time and cost allowance should be made for adapting the applications to

Modjo and other operating systems at Djibouti port, Customs, etc. The current development and implementation process of a suitable terminal operating system (TOS) triggered by EMAA in 2018 is good contribution to that.

Table 41: Space Requirements for Container Facility

		2019	2020	2025	2030	2035	2040	2043
Container								
Total volumes	Throughput	284,151	313,678	504,806	655,693	849,836	1,010,097	1,077,984
thereof Import	TEU	*144,736*	*159,653*	*255,947*	*331,172*	*427,570*	*506,231*	*538,992*
thereof MT Import	TEU	*141*	*156*	*251*	*327*	*424*	*505*	*539*
thereof Export	TEU	*0*	*784*	*5,048*	*41,072*	*97,967*	*169,612*	*215,058*
thereof MT Export	TEU	*139,274*	*153,085*	*243,560*	*283,123*	*323,875*	*333,750*	*323,395*
Dwell time import full	days	60	25	25	20	15	10	8
Dwell time export full	days	5	5	5	5	5	5	5
Dwell time export empty	days	30	25	25	20	15	10	10
Stacking height full RS	#	4	4	4	4	4	4	4
Stacking height full RTG	#	6	6	6	6	6	6	6
Stacking height empty ECH	#	3	3	4	5	5	5	5
Days per year	days	365	365	365	365	365	365	365
Peak factor	#	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Utilisation	%	85%	85%	85%	85%	85%	85%	85%
Total groundslots RS & ECH	TEU-GS	13,217	8,437	11,603	10,532	10,005	7,957	7,395
Total groundslots RTG &ECH	TEU-GS	10,534	7,203	9,618	8,422	7,873	6,131	5,731
Share of full Container in RS Area	%	100%	100%	50%	50%	45%	35%	35%
Share of full Container in RTG Area	%	0%	0%	50%	50%	55%	65%	65%
Required RS space	sqm	234,358	107,831	86,690	92,150	83,839	55,832	50,889
Required RTG space	sqm	0	0	46,953	49,911	55,513	56,164	51,197
Required ECH space	sqm	150,521	137,854	164,499	122,391	105,036	72,188	69,946
Total Space	sqm	**384,879**	**245,685**	**298,142**	**264,452**	**244,389**	**184,184**	**172,032**
Thereof								
Existing Area	*ha*	*38.5*	*24.6*	*25.1*	*21.5*	*18.9*	*12.8*	*12.1*
New Extension Area	*ha*	*0.0*	*0.0*	*4.7*	*5.0*	*5.6*	*5.6*	*5.1*

Source: Based on data from EMAA, market survey, international benchmark

The table above shows the calculation for the required space needed for the storage of containers. The calculation is related to the total number of containers projected to be handled at MGLH. The yellow marked parameters are representing assumptions based on analysis of current operation at Modjo, market survey and international standards. When considering space for container handling, always the existing container yard is included. The comparatively low stacking height of empty containers as well as the current tremendous average dwell time of full containers significantly influence the space efficiency and demand for additional land.

An improvement in dwell time is assumed during the future years. This assumption is mainly based on the expected development that in the future the Customs Commission

Proclamation will be amended to remove eligible cargoes on time and additional interim storage areas (outside the MGLH) will be established by the Customs Commission in order to move cargoes there which are not picked-up within the proposed time frame. Also the integration of processes of the different agencies will improve and also support a swifter processing. These aspects all influence mainly the dwell time of full import containers which will improve to 25 days by 2020, 20 days by 2030, 15 days by 2035, 10 days by 2040, and 8 days by 2043. The dwell time for full export containers has to be comparatively low from the very beginning on – otherwise the market will not accept and utilize MGLH as a competitive facility. It is assumed being 5 days over the total project period. The dwell time of empty export containers mainly develops in the same range like full import containers.

In addition to that the Consultant decided to indicate a suitable date when space efficiency improving measures has to be taken by implementing new storage equipment. The use of different equipment for full container handling is considered, as the current reach stacker operations are quite space intensive. Therefore the implementations of rubber-tyred gantries (RTG), which stack the container higher and need smaller driving lanes, have been considered as suitable container yard equipment. Knowing that on the current container yard only four full containers on one stack could be stored the implementation of RTGs has to happen on a newly prepared area of the Modjo expansion area where the satckling of six full containers over each other is facilitated. The following table shows the required numbers of empty container handlers (ECH) reach stackers (RS) as well as RTGs.

Table 42: Equipment Requirements for Container Handling

Empty Container Handling		2019	2020	2021	2022	2025	2030	2035	2040	2043
Handling Volumes	'000 bx.	87.0	95.7	105.1	115.3	152.2	177.2	202.7	208.9	202.5
Moves / Container	moves	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Total Annual Moves	moves	217,617	239,195	262,682	288,353	380,562	442,891	506,717	522,273	506,148
Moves/ECH p.a.	moves	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000
Equipment Availability	%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Required ECHs	**#**	**4**	**4**	**5**	**5**	**7**	**8**	**9**	**9**	**9**

Full Container Handling RS		2019	2020	2021	2022	2025	2030	2035	2040	2043
Handling Volumes	'000 bx.	90.5	100.3	111.1	61.3	81.6	116.3	147.8	147.8	164.9
Moves / Container	moves	3	3	3	3	3	3	3	3	3
Total Annual Moves	moves	271,380	300,820	333,161	184,044	244,684	348,979	443,422	443,522	494,846
Moves/Reach Stacker p.a.	moves	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
Equipment Availability	%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Required Reach Stackers	**#**	**6**	**6**	**7**	**4**	**5**	**7**	**9**	**9**	**10**

Full Container Handling RTG		2019	2020	2021	2022	2025	2030	2035	2040	2043
Handling Volumes	'000 bx.	0.0	0.0	0.0	61.3	81.6	116.3	180.7	274.6	306.3
Moves / Container	moves	3	3	3	3	3	3	3	3	3
Total Annual Moves	moves	0	0	0	184,044	244,684	348,979	541,960	823,684	918,999
Moves/RTG p.a.	moves	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000
Equipment Availability	%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Required RTGs	**#**	**0**	**0**	**0**	**3**	**4**	**5**	**8**	**12**	**13**

Source: Based on data from EMAA, market survey, international benchmark

Reach stacker and empty container handler are used on the existing Modjo Dry Port area and RTG are used on a new prepared space within the expansion area.

The demand for efficient storage is constantly rising. It is planned that MGLH also handles full export container that are not stuffed within the hub. For 2019 no full export containers are expected at Modjo (like in the past). But a small number of full export containers are expected to be handled from 2020 on. This number will grow comparatively slow until 2025. From 2025 on, the full export container share increases gradually in order to reach a share of 20% of throughput in 2043.

As Modjo provides currently only reach stacker operations it is expected that this will be kept for the first years. Regarding the required space already in 2022 half of the full containers have to be stacked and stored under RTGs. If the dwell times for full containers will develop as described before, and the share of full containers stored under RTG will increase to 65% until 2040, an RTG area of 5 – 6 hectares is required over the whole projection period. The following figure shows a RTG.

Figure 20: Rubber-tyred Gantry

Source: HPC 2018

The stacking of empty containers is recommended to be conducted by empty container handlers (ECH). The current stacking height of three for empties is justified by temporary wind conditions. Compared to other empty container storages where also temporarily strong winds occur (e.g. sea ports in general located directly at the sea) the stacking of empties is technically and processually possible for up to seven-high. Believing in the implementation of measures to improve stacking height for empties in the future an increase of this parameter has been considered (4-high from 2025 on and 5-high from 2030 on).

4.2 Import Deconsolidation Facility

Currently full import containers are only destuffed at Modjo Dry Port for comprehensive customs check. But the destuffing of full import containers in order to facilitate the distribution of the cargo in smaller units is a service being demanded by the market. For this service unstuffing and storage facilities are required. Space will be needed for destuffing import containers. The cargo will be stored and then distributed in smaller units. The following table shows the required space for a deconsolidation facility.

Table 43: Space Requirements for Import Deconsolidation Facility

		2022	2025	2030	2035	2040	2043
Import Deconsolidation							
Import volumes	**TEU**	193,645	255,947	331,172	427,570	506,231	538,992
Stripping percentage	**%**	10%	15%	20%	20%	20%	20%
tonnes per import container	**tonnes**	15	15	15	15	15	15
Peak	**#**	1.2	1.2	1.2	1.2	1.2	1.2
Dwell time of unstuffed cargo	**days**	20	15	10	10	10	10
tons/sqm storage	**t/sqm**	0.8	0.8	0.8	0.8	0.8	0.8
Utilisation rate	**%**	80%	80%	80%	80%	80%	80%
days per year	**days**	365	365	365	365	365	365
net storage	**sqm**	29,843	44,374	51,037	65,893	78,015	83,064
gross/net factor	**#**	3	3	3	3	3	3
Total area container stripping storage	**sqm**	**89,528**	**133,123**	**153,110**	**197,678**	**234,045**	**249,192**
Thereof							
Existing Area	*ha*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
New Extension Area	*ha*	*9.0*	*13.3*	*15.3*	*19.8*	*23.4*	*24.9*

Source: Based on data from EMAA, market survey, international benchmark

Not all full import containers are expected to be deconsolidated and unstuffed at such a facility. A share of 10% is assumed to be handled in 2022 in order to increase to 15% in 2025 and staying constant at 20% from 2030 on. As well as for the handling of containers mentioned in the previous section a decrease of dwell time of unstuffed cargo is assumed. The expected development of relocation of containers and cargo stored too long and not picked up after a specific period of time has the major impact of reduction of dwell time. In the case of the import deconsolidation centre dwell time is expected to be 20 days in 2022, to be reduced to 15 in 2025 and to 10 days from 2030 on. Space required in 2022 is around 9 ha and reaches almost 25 ha in 2043.

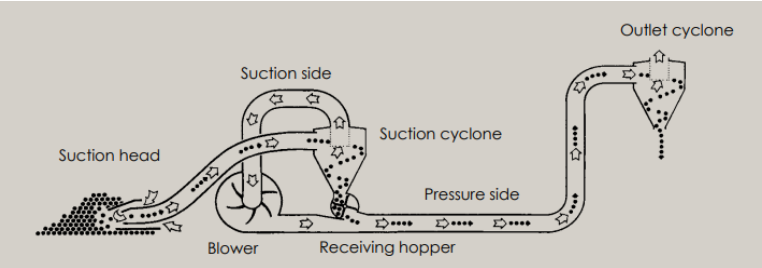
4.3 Grain Import Facility

The Ethiopian Government imports about 800,000 tonnes of wheat a year that it distributes to warehouses throughout the country. It is imported to stabilize bread prices in the country. Ethiopian Trading Business Corporation (ETBC) distributes to cooperating flour mills and bakeries throughout the country that agree to sell bread at reduced prices. Therefore it is a relatively stable program with deliveries throughout the year and likely to continue for some time. It is not affected by the surges in imports caused by drought relief and even increased grain production in the country is unlikely to replace it in the near future. In addition, even countries with good wheat production, import other varieties of wheat needed for bread production. The projections and market survey suggest this as a safe investment in an intermodal system that imports as bulk by rail and bags for distribution throughout the country by road. Modjo can successfully serve the central and southern part of the country. The North would continue to use trucks for the entire route until the rail line is completed to Kombolcha (2020) and a similar intermodal rail to road arrangement could be constructed at Kombolcha Dry Port. The railway can run 2 bulk trains a day of 37 wagons carrying 70 tonnes each when needed by the volumes arriving at the port. . Since the grain and fertilizer seasons overlap, this may often necessitate one train for grain and one for fertilizer.

Requirements for the Grain import, bagging and distribution

- Silo storage capacity of 100,000 to 150,000 tonnes, the equivalent of 2-3 shiploads as buffer storage
- Warehouse capacity for storing bags
- Bagging machines
- Blowing machines

Figure 21: Scheme of Blowing Machine Procedures



Source: Kongskilde 2018

The following table shows the required space for the silo storage of grain. As the capacity of a silo is calculated in cubic meters (m^3) the forecasted annual volumes has to be converted from tonnes into cubic meters. Therefor the density of the commodity has to be considered. In this specific case the density is 0.66 tonnes/m^3. Using the calculated volume the required capacity of the silos is defined. The implementation of 20 meter high silos is assumed. Also the required space for bagging machines as well as the interim storage of a share of 10% of bagged cargo is considered. The interim storage is required as it assumed that not always the required transport capacity is available in each moment. The 'just in time bagging' of grain as currently conducted in Djibouti shows some bottlenecks and leads to long waiting times for trucks. The interim storage facilitates the preparation of trucks loads which, once the truck arrives, could be comparatively fasten the loading process of the truck by using forklifts. This again remarkably reduces the dwell time of 'grain trucks' within the MGLH area and also reduces the required number of loading docks.

Grain facility is planned completely on the extension area and does not use space of the existing dry port. This mainly due to the fact that the facility is recommended to be close to the (new) exclusive dry bulk tracks which also will be located on the extension area.

Table 44: Space Requirements for Grain Facility

		2022	2025	2030	2035	2040	2043
Grain							
Annual volumes	**tons**	377,585	468,415	572,520	679,693	785,380	846,010
bulk density	**t/m³**	0.660	0.660	0.660	0.660	0.660	0.660
Volume	**m³**	572,099	709,719	867,454	1,029,838	1,189,969	1,281,833
Days per year	**d**	365	365	365	365	365	365
Dwell time	**d**	15	15	15	15	15	15
Utilisation	**%**	60%	60%	60%	60%	60%	60%
Net storage volume	**m³**	78,370	97,222	118,830	141,074	163,010	175,594
Specific silo radius	**m**	10	10	10	10	10	10
Specific silo area	**m²**	314.2	314.2	314.2	314.2	314.2	314.2
gross/net factor	**#**	3.5	3.5	3.5	3.5	3.5	3.5
Required silos 20m height	**#**	***12***	***15***	***19***	***22***	***26***	***28***
Gross area required for silo	**sqm**	***13,715***	***17,014***	***20,795***	***24,688***	***28,527***	***30,729***
Bagging facility	**sqm**	***800***	***800***	***800***	***800***	***800***	***800***
Storage (10%; 1.5 tonnes/m²)	**sqm**	***7,916***	***9,820***	***12,003***	***14,250***	***16,466***	***17,737***
Total Grain Area	**sqm**	***22,431***	***27,634***	***33,598***	***39,738***	***45,792***	***49,266***
Thereof							
Existing Area	*ha*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
New Extension Area	*ha*	*2.2*	*2.8*	*3.4*	*4.0*	*4.6*	*4.9*

Source: Based on data from EMAA, market survey, international benchmark

4.4 Fertilizer Import Facility

Import of fertilizer is also a government program designed to deliver reduced cost of fertilizer to the farmer by buying in bulk and to encourage greater use of fertilizer. Each year the Ministry of Agriculture asks farmers at the local Kabele level through extension agents and cooperatives to estimate the amount of fertilizer they will purchase for the coming year. The Ministry of Agriculture coordinates with the Ethiopian Agricultural Business Corporation which is responsible for the purchase and distribution of the fertilizer at the cost of product plus transport and logistics. This has been a reliable program since its inception, however, it is not year round, but tied to the agricultural cycles. Fertilizer imports begin in November or December and peak between April and June. Currently fertilizer is mostly picked up at shipside and hauled directly to about 100 zonal warehouses in Oromia, Southern Region, Benishangul Gumuz, Amhara and Tigray. The proposed system could transfer fertilizer as bulk from the ship by rail to Modjo where it would be offloaded into silos, for bagging and distributing to the roughly 100 zonal warehouses.

An agreement has been signed for a PPP between a Moroccan company and a state owned Ethiopian company to produce fertilizer at Dire Dawa. Once fully operational, it will be able to meet Ethiopian requirements volume-wise and possibly have some for exports. Nevertheless, there will be real benefits to using this intermodal delivery system via MGLH in the near term. The system might be used for fertilizer until the new company is completed, at which time the fertilizer capacity would be shifted to grain or other import commodities. It is also possible with a factory at Dire Dawa which is on the rail line to Modjo, that the factory would continue to use the intermodal system for reaching its market in central Ethiopia. It might also be, that the new factory will not produce all demanded fertilizer brands/types, which again requires fertilizer import which could be handled via Modjo.

Requirements for the Fertilizer import, bagging and distribution

- Storage capacity of 100,000 to 150,000 tonnes, the equivalent of 2-3 shiploads as buffer storage
- Warehouse capacity for storing bags
- Bagging machines
- Blowing machines

Due to the fact, that the decision for investing in fertilizer handling facilities at Modjo, as plans for a fertilizer production plans still exist, comprises some risks, the Consultant suggests deciding to use a warehouse for storing the fertilizer and not silos. If fertilizer imports would drop remarkably or even to zero, a warehouse facility might be easier to rededicate than silos. The following figure shows a fertilizer warehouse served by a conveyor belt system.

Figure 22: Example of a Fertilizer Warehouse

Source: HPC 2018

The following table shows the capacity calculation for a fertilizer warehouse. Assuming that dwell time of fertilizer in the warehouse will be improved from 22 days in 2019 to 14 days in 2043 a total area including bagging facility and interim storage for bagged fertilizer of 4.8 hectares will be required at the end of the projection period.

Table 45: Space Requirements for Fertilizer Facility

		2022	2025	2030	2035	2040	2043
Fertilizer							
Annual volumes	**tons**	521,072	656,535	769,143	874,608	965,123	1,009,126
bulk density	**t/m³**	1.100	1.100	1.100	1.100	1.100	1.100
Volume	**m³**	473,702	596,850	699,221	795,098	877,384	917,387
Peak	**#**	1.6	1.6	1.6	1.6	1.6	1.6
Days per year	**d**	365	365	365	365	365	365
Dwell time	**d**	22	18	16	14	14	14
Utilisation	**%**	60%	60%	60%	60%	60%	60%
Peak storage requirements	**tons**	83,752	86,339	89,909	89,458	98,716	103,217
Angle of response	**degree**	30.00	30.00	30.00	30.00	30.00	30.00
Max construction height	**m**	10.00	10.00	10.00	10.00	10.00	10.00
Width of stockpile	**m**	34.64	34.64	34.64	34.64	34.64	34.64
Cbm per linear metre stockpile	**m³**	173.21	173.21	173.21	173.21	173.21	173.21
Tons per linear metre stockpile	**t**	190.53	190.53	190.53	190.53	190.53	190.53
Length of Stockpile average	**m**	439.59	453.16	471.90	469.53	518.12	541.75
Net storage area	**sqm**	15,228	15,698	16,347	16,265	17,948	18,767
gross/net factor	**#**	2.5	2.5	2.5	2.5	2.5	2.5
Required area for storage	***sqm***	***38,069***	***39,245***	***40,868***	***40,663***	***44,871***	***46,917***
Bagging facility	***sqm***	***800***	***800***	***800***	***800***	***800***	***800***
Interim storage (10%; 1.5 tonnes/m²)	***sqm***	***16,750***	***17,268***	***17,982***	***17,892***	***19,743***	***20,643***
Total Space required	***sqm***	***55,620***	***57,313***	***59,650***	***59,354***	***65,414***	***68,360***
Thereof							
Existing Area	*ha*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
New Extension Area	*ha*	*5.6*	*5.7*	*6.0*	*5.9*	*6.5*	*6.8*

Source: Based on data from EMAA, market survey, international benchmark

4.5 General Cargo Import Facility

It has been suggested that this category of imports be carried by rail to Modjo to be stored until needed.

Table 46: Steel and Iron Products Imported into Ethiopia, 2013-2017 (tonnes)

Product	Tonnes				
	2013	2014	2015	2016	2017
Bars and rods, of iron or non-alloy steel, not further worked than forged, hot-rolled, hot-drawn ...	290,885	289,055	504,858	515,861	337,262
Bars and rods of iron or non-alloy steel, hot-rolled, in irregularly wound coils	75,541	45,417	41,579	50,788	18,751
Bars and rods, of iron or non-alloy steel, cold-formed or cold-finished, whether or not further ...	8,420	11,035	5,053	3,659	2,684
Bars and rods of alloy steel other than stainless, hot-rolled, in irregularly wound coils		3,724	156	2,340	762
Bars and rods of stainless steel, hot-rolled, in irregularly wound coils	-	11	32	106	19
Flat-rolled products of iron or non-alloy steel, of a width >= 600 mm, hot-rolled or cold-rolled ...	349,353	374,814	487,388	623,766	534,906
Flat-rolled products of alloy steel other than stainless, of a width of < 600 mm, hot-rolled ...	496	1,837	3,057	33,044	11,650
Flat-rolled products of stainless steel, of a width of < 600 mm, hot-rolled or cold-rolled ...	12,772	12,230	7,961	9,720	1,915
Wire of iron or non-alloy steel, in coils (excluding bars and rods)	17,048	22,265	19,452	27,830	24,366
Other bars and rods of stainless steel; angles, shapes and sections of stainless steel, n.e.s.	562	5,460	4,160	315	1,153
Other bars and rods of alloy steel other than stainless, angles, shapes and sections of alloy ...	8,064	5,451	2,275	6,900	2,242
Semi-finished products of iron or non-alloy steel	46,303	155,888	277,685	401,170	312,243
Angles, shapes and sections of iron or non-alloy steel, n.e.s.	17,984	18,759	27,993	36,644	19,745
Ferro-alloys	1,746	1,398	1,796	1,453	1,247
Granules and powders of pig iron, spiegeleisen, iron or steel (excluding granules and powders ...	99	40	51	21	36
Stainless steel in ingots or other primary forms (excluding remelting scrap ingots and products ...	9	16	135	206	18
Iron and non-alloy steel in ingots or other primary forms (excluding remelting scrap ingots, ...	168	32	16	3	4
Total	**829,450**	**947,432**	**1,383,647**	**1,713,826**	**1,269,003**

Source: ITC, Trademap, 2018

For some time, there has been a great deal of this type of cargo stored at Djibouti in the Djibouti Dry Port which remains full and in other places such as the old railway yard. The issue is whether there would be added value in bringing this cargo to Modjo. Steel is a major component of this category. The storage fee for a metric tonne of steel is USD 0.05. The cost of loading a metric tonne of steel in Djibouti is USD 4.5 To load it in Modjo or at the project site will be less, but nevertheless expensive. The steel can be moved by rail, but it is one of the most expensive commodities on the rail system at 0.056 USD/ton/km. Each tonne of steel would cost 36.9 USD from Djibouti to Modjo. Furthermore, there is a risk of damage each time the steel rod is moved. As long as the steel rod is in Djibouti, the Djibouti port has the liability for any damage. Once it is moved, ESLSE or another forwarder will have that liability. The other disadvantage of bringing the steel to Modjo is that steel is generally not picked up quickly. In Modjo, it

would take up space that could be used for a more productive activity. Recognizing these factors, it is still considered advisable to avoid the added costs in USD, and to move the general cargo to Modjo. An incentive system should be designed to ensure that it is collected rapidly.

Heavy equipment and machinery is also difficult to move and very valuable. The chance of damage through multiple moves seems to make the option of leaving it at the port until the buyer arranges shipment the better option. Djibouti has proven to be reliable on insurance coverage for the port. In contacting the Renaissance Dam Project Office, it was found that the international construction company does the procurement and delivery to the dam. This may be the same as for other projects. For all of these reasons, it is advisable that this cargo not be handled at Modjo.

Taking the conditions and parameters mentioned above into account, but not excluding the handling of general cargo from MGLH the following space requirements have been developed.

Table 47: Space Requirements for General Cargo Facility

		2022	2025	2030	2035	2040	2043
General Cargo							
Annual volumes	**tons**	409,100	672,437	965,409	1,278,123	1,564,186	1,709,070
tons/sqm	**tons**	3.0	3.0	3.0	3.0	3.0	3.0
Peak	**#**	1.2	1.2	1.2	1.2	1.2	1.2
Days per year	**d**	365	365	365	365	365	365
Dwell time of GC before dispatched	**d**	30	30	30	30	30	30
Utilisation	**%**	80%	80%	80%	80%	80%	80%
Net storage area	**sqm**	16,813	27,635	39,675	52,526	64,282	70,236
gross/net factor	**#**	3	3	3	3	3	3
Storage requirements	***sqm***	***50,439***	***82,905***	***119,025***	***157,578***	***192,846***	***210,708***
Thereof							
Existing Area	*ha*	*0.0*	*0.0*	*5.0*	*5.0*	*10.0*	*10.0*
New Extension Area	*ha*	*5.0*	*8.3*	*6.9*	*10.8*	*9.3*	*11.1*

Source: Based on data from EMAA, market survey, international benchmark

As described before the current dwell time of general cargo (steel and project cargo) is very long. The used dwell time in the space requirements calculation above is

representing the fact that not all general cargo is transported to Modjo but exclusively the that share which is not being expected to stay an extraordinary period of time at MGLH. The dwell time is not decreasing like at most of the other commodities as the general cargo business is expected being a commodity where comparatively long dwell times will play a major role.

By increasing the efficiency of container handling, space becomes available over the years on the former Modjo Dry Port area. Hence, this 'gained' space is recommended to be used by the storage of general cargo. From 2030 on five ha are expected to be provided for general cargo storage on the Modjo Dry Port area and ten ha from 2040 on.

4.6 Vehicle Import Facility

There are car parks associated with Djibouti Port. It may be advantageous to the buyer of vehicles to collect the vehicle at Modjo rather than Djibouti. The railway has cars for carrying vehicles. Increasingly vehicles are arriving in container. In this case, the vehicles would arrive on the same train as any other container. The other consideration is whether having individual owners come to clear their vehicles and drive them out, adds unnecessary additional traffic in a situation where there will be a high volume of trucks bringing goods for export and trucks carrying grain and fertilizer out of the terminal for delivery.

Table below indicates the volume of all vehicle types arriving in Ethiopia over the past five years. Since 2014 the volume of vehicle imports has been increasing steadily.

Table 48: Vehicle Imports from 2013 to 2017 (tonnes)

Product	2013	2014	2015	2016	2017
Motor vehicles for the transport of goods	93601	71573	101988	106850	121083
Motor cars and other motor vehicles principally designed for the transport of persons	25059	27366	31922	38675	41162
Trailers and semi-trailers; other vehicles, not mechanically propelled	8564	10190	20572	20055	20152
Motor vehicles for the transport of >= 10 persons, incl. driver	12203	18504	22352	16707	16919
Parts and accessories for tractors, motor vehicles for the transport of ten or more persons, ...	6456	8881	8575	9212	9667
Special purpose motor vehicles (other than those principally designed for the transport of ...	7398	11552	8913	9295	8592
Motorcycles, incl. mopeds, and cycles fitted with an auxiliary motor, with or without side-cars; ...	2703	3679	5004	5870	6572
Tractors (other than tractors of heading 8709)	15,024	8,142	7,049	5,444	3,597
TOTAL	**171,008**	**159,887**	**206,375**	**212,108**	**227,744**

Source: ITC, Trademap, 2018

There are car parks associated with Djibouti Port. Vehicle storage in Djibouti is allowed an eight day grace period. Depending on the weight of the vehicle, storage beyond the

eight days varies between USD 2.15 to 13.6 per unit/per day. Semera Dry Port was built in Afar Region and is often used as a transit node for vehicles. Djiboutian drivers are hired to drive the vehicle to Semera and then an Ethiopian driver drives it in transit to one of the dry ports or to Addis Ababa. Vehicles are commonly driven to Gelan Dry Port for customs and vehicle clearance before releasing to the owner. It is also envisioned that Modjo would be used for vehicles due to its proximity to population centres and the presence of the railway option. The tariff for a small vehicle by rail is 0.076 USD per unit per km. The railway has cars for carrying small vehicles and about half of vehicles now arrive in containers. In this case, the vehicles would arrive on the same train as any other container. The other consideration is whether having individual owners come to clear their vehicles and drive them out, adds unnecessary additional traffic in a situation where there will be a high volume of trucks bringing goods for export and trucks carrying grain and fertilizer out of the terminal for delivery.

Table 49: Space Requirements for Vehicle Facility

		2022	2025	2030	2035	2040	2043
Vehicles							
Annual volumes	**cars**	23,849	32,844	64,992	104,847	130,106	136,092
sqm/car	**sqm**	12.5	12.5	12.5	12.5	12.5	12.5
Peak	**#**	1.2	1.2	1.2	1.2	1.2	1.2
Days per year	**d**	365	365	365	365	365	365
Dwell time	**d**	20	17	15	12	12	12
Utilisation	**%**	80%	80%	80%	80%	80%	80%
Net storage area	**sqm**	24,503	28,683	50,079	64,632	80,202	83,892
gross/net factor	**#**	2	2	2	2	2	2
Storage requirements	***sqm***	***49,005***	***57,365***	***100,159***	***129,263***	***160,405***	***167,784***
Thereof							
Existing Area	*ha*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
New Extension Area	*ha*	*4.9*	*5.7*	*10.0*	*12.9*	*16.0*	*16.8*

Source: Based on data from EMAA, market survey, international benchmark

As currently at Djibouti Port a free storage of cars is possible up to eight days it has been assumed that probably MGLH could provide a unique selling proposition by offering a longer free storage, which results in a higher dwell time per vehicle. This is described by an average dwell time of 20 days in 2022 which decreases to 17 days in 2025, 15 days in 2030 and reaches 12 days from 2035 on.

The high storage utilization of 80% represents the assumption that the majorit of cars will not be picked-up by the individual buyers but by car carrying trucks with a laod capacity of 8 cars per trip. The vehicle storage is an open storage and no further equipment for handling them is required.

4.7 Export Consolidation Facility

As illustrated in the demand analysis, many of Ethiopia's export products are agricultural or light manufacturing. GTP II makes promotion of these products a high priority. A variety of challenges have been identified in the market survey. Many of the agricultural products travel to the port in bags to be containerized in Djibouti. In this way the exporter loses control of the product just as it is being exported. A variety of problems have been identified in the market survey. Sometimes the Djiboutian transitaire has difficulty locating a container from the nominated shipping line. The cargo is left out waiting and its condition deteriorates. Sometimes the condition or cleanliness of the container is not suitable for food products. Furthermore, some product is being pilfered in transit or in Djibouti. The imbalance between imports and exports leads to high availability of empty containers at Modjo. The problems currently are transferring those containers to exporters as well as the added weight of the container which adds to the transport cost. A further time consuming process is the obtaining the inspections and certifications necessary for export, which often means driving from one agency to another in Addis Ababa.

The concept of the export centre is that the product can be delivered to a warehouse at Modjo where it is containerized. Orders for containers by size and shipping line must be received in advance so that the right containers are cleaned and inspected. Hence, it is available in the right condition when needed for stuffing of export cargo. The regulatory agencies involved in clearing exports for quality, phyto-sanitary conditions of the container, Ministry of Trade and Industry approval of quality, etc. would have small offices in the export centre for each regulatory agency (total of five) and shipping line representatives. Once all the procedures are done, Customs will place a seal on the container in the presence of the shipping agent who would also approve the shipment. The goods would then be loaded on the train for for transport to Djibouti.

The railway is planning two container trains every day on a mid-term perspective. So there would be sufficient capacity for 212 TEU per day on the train. Railway transport is known to be more secure than road transport. Trucks take two days to drive from Addis Ababa and the overnight stop offers opportunities for theft from bags and from containers in which holes can be drilled and repaired overnight. Since road transporters generally drive to Djibouti empty and need to recover the cost of the round trip, the cost for import cargoes is almost double that of exports. Exports when they can be achieved are a bonus that the road transporter wants to attract. This factor can be seen in the rail prices as well where coffee and sesame exports are 0.28 USD per tonne/km, while wheat imports are 0,45 USD per tonne/km and fertilizer is 0.49 USD per tonne/km. This benefits the exporter.

Requirements for the Export Centre

- Warehouses for coffee, sesame, pulses, horticulture products and light manufacturing goods.

- Office block for regulatory agencies and shipping lines/freight forwarders - total 10. Each office needs Wi-Fi and connectivity to the home office. The Coffee Liquorisation Unit (CLU) grades and evaluates all coffee exports for quality. It has a complete laboratory in the Jacos area of Addis Ababa where many of the coffee exporters are located It is needed in Jacos for exporters who don't use Modjo because the sell specialty coffee which they airfreight or decide to continue to use their current arrangements for exporting. CLU would be interested in building a second laboratory at Modjo. They estimate it should be 3000 to 4000 square meters and construction of the building and equipment would be about USD 2 million. The other regulatory agencies need offices and access to the export inspection areas, the include Customs, Ministry of Agriculture for SPS certification, and Ministry of Trade and Industry for quality testing and compliance with Ethiopian national standards for sesame.

- Blowing machine for filling containers with bulk coffee which can be stored in the buyers' silos abroad.

- Forklifts and tractor trailer systems for moving containers within Green Logistics Hub.

- Facility for labelling bags, packaging specialty coffee being sent from farm directly to buyer and other value added activities. Some exporters use special kinds of paper inside the container to protect the product or further buyer's requests.

Table 50: Space Requirements for Coffee Facility

		2022	2025	2030	2035	2040	2043
Coffee							
Annual volumes	**tons**	44,117	79,324	171,075	253,781	352,135	415,061
tons/sqm	**tons**	0.8	0.8	0.8	0.8	0.8	0.8
Peak	**#**	1.2	1.2	1.2	1.2	1.2	1.2
Days per year	**d**	365	365	365	365	365	365
Dwell time of coffee until stuffed	**d**	2	2	2	2	2	2
Utilisation	**%**	80%	80%	80%	80%	80%	80%
Net storage area	**sqm**	454	815	1758	2608	3618	4265
gross/net factor	**#**	4	4	4	4	4	4
Gross Storage requirements	***sqm***	***1,816***	***3,260***	***7,032***	***10,432***	***14,472***	***17,060***
Thereof							
Existing Area	*ha*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
New Extension Area	*ha*	*0.2*	*0.3*	*0.7*	*1.0*	*1.4*	*1.7*

Source: Based on data from EMAA, market survey, international benchmark

The calculation for space requirements for handling of coffee are shown above. The annually handled volumes are provided by the forecast elaborated previously. The assumed tonnes per square metre are referring to international benchmark figures. The very short dwell time of two days for the whole projection period expresses the necessity of swift commodity handling in order to establish MGLH as an accepted 'coffee hub' by the exporters. If processes at MGLH do not facilitate a fast handling of coffee the cargo flow will not be shifted from the existing procedures to the new ones via MGLH.

In order to show best practice case of required dimensions for the handling and storage of coffee the figures of a newly built facility in Colombia in 2018 are mentioned[30]. This 4,400 sqm large distribution centre has a capacity of monthly 200,000 bags of coffee. Taking the forecasted coffee volume for 2022 at MGLH of 44,117 tonnes per annum, which stays for almost 3,700 tonnes per month or 61,200 bags (of 60 kg), the required net space for distribution activities would have been 1,350 sqm according to the volume space ratio of the Colombian facility. The calculated space required at MGLH of 1,800 sqm in 2022 includes additional areas for bagging, labelling and other services.

[30] Café de Colombia insights; www.cafedecolombia.com

Table 51: Space Requirements for Oilseeds Facility

		2022	2025	2030	2035	2040	2043
Oilseeds							
Annual volumes	**tons**	37,861	60,017	104,404	160,174	229,730	278,933
tons/sqm	**tons**	0.8	0.8	0.8	0.8	0.8	0.8
Peak	**#**	1.2	1.2	1.2	1.2	1.2	1.2
Days per year	**d**	365	365	365	365	365	365
Dwell timeof oilseeds until stuffed	**d**	10	10	7	7	7	7
Utilisation	**%**	80%	80%	80%	80%	80%	80%
Net storage area	**sqm**	1,945	3,084	3,755	5,760	8,261	10,031
gross/net factor	**#**	3	3	3	3	3	3
Storage requirements	***sqm***	***5,835***	***9,252***	***11,265***	***17,280***	***24,783***	***30,093***
Thereof							
Existing Area	*ha*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
New Extension Area	*ha*	*0.6*	*0.9*	*1.1*	*1.7*	*2.5*	*3.0*

Source: Based on data from EMAA, market survey, international benchmark

Like coffee also oilseeds require certain processing steps before being long distance transported. This also includes bagging as well as all the formal procedures described in the introduction of this sub section. Dwell time is assumed higher than e.g. for coffee as this was indicated by the market during the market survey.

4.8 Cool Chain Facility

The area within 50 to 100 km of Modjo is ideal for growing vegetables for export. The facility will need a delivery port, washing area for vegetables, packaging and cool rooms where temperature can gradually be reduced to the level required for the specific product. The goal would be to develop this area as a joint venture or PPP between an Ethiopian company and an international investor in the horticulture sector. Therefore this would require paving and access to all the utilities. The investors would then develop the facility to meet their specifications. Ideally, an importer requiring reefer containers for imports would be attracted to the cool chain area so that reefer containers would be utilized in both directions and thereby reduce costs. Horticulture associations which have explored market opportunities have found the greater obstacle and cost factor to be the need to bring empty reefer containers inland, reefer containers being far more scarce and expensive.

Commodities considered to be handled within a cool chain via MGLH are fruits and vegetables. The space requirements are shown in the following tables.

Table 52: Space Requirements for Fruit Facility

		2022	2025	2030	2035	2040	2043
Fruit							
Annual volumes	**tons**	7,390	12,358	21,476	32,810	48,051	59,352
tons/sqm	**tons**	0.8	0.8	0.8	0.8	0.8	0.8
Peak	**#**	1.2	1.2	1.2	1.2	1.2	1.2
Days per year	**d**	365	365	365	365	365	365
Dwell time	**d**	2	2	2	2	2	2
Utilisation	**%**	60%	60%	60%	60%	60%	60%
Net storage area	**sqm**	122	204	354	540	790	976
gross/net factor	**#**	6	6	6	6	6	6
Storage requirements	***sqm***	***732***	***1,224***	***2,124***	***3,240***	***4,740***	***5,856***
Thereof							
Existing Area	*ha*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
New Extension Area	*ha*	*0.1*	*0.1*	*0.2*	*0.3*	*0.5*	*0.6*

Source: Based on data from EMAA, market survey, international benchmark

The quantity expressed in tonnes is remarkably less compared to other commodities already described. But the space required is however comparatively large. The used gross/net factor is six. This expresses the space needed for washing and treating the commodity before the long-distance transport. Fruits partly need voluminous packaging in order to prevent them from being damaged. A suitable amount of packaging material has to be stored in this area to have it at hand when needed.

Table 53: Space Requirements for Vegetables Facility

		2022	2025	2030	2035	2040	2043
Vegetables							
Annual volumes	**tons**	70,272	122,272	184,220	268,988	383,042	468,711
tons/sqm	**tons**	0.8	0.8	0.8	0.8	0.8	0.8
Peak	**#**	1.2	1.2	1.2	1.2	1.2	1.2
Days per year	**d**	365	365	365	365	365	365
Dwell time	**d**	2	2	2	2	2	2
Utilisation	**%**	70%	70%	70%	70%	70%	70%
Net storage area	**sqm**	826	1436	2164	3159	4498	5504
gross/net factor	**#**	5	5	5	5	5	5
Storage requirements	***sqm***	***4,130***	***7,180***	***10,820***	***15,795***	***22,490***	***27,520***
Thereof							
Existing Area	*ha*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
New Extension Area	*ha*	*0.4*	*0.7*	*1.1*	*1.6*	*2.2*	*2.8*

Source: Based on data from EMAA, market survey, international benchmark

The handling of vegetables almost needs as much space per tonne as fruits which is expressed by the gross/net factor of five. Dwell time is also taken as comparatively low as the perishable good really have to moved fast through Modjo or better have to

prepared quick for the long-distance transport. If these goods would stay longer at Modjo, it is likely that current transport chains will remain, despite all their disadvantages mentioned previously. Used parameters all stay quite constant during the complete projection phase. Due to the forecasted volume development for Modjo the required space for handling of vegetables increases to 2.8 ha within MGLH.

Facilities for col chain are currently not available at Modjo Dry Port. Hence, the required space for building new facilities s is expected to be completed utilized on the extension area of the MGLH.

4.9 Customs Inspection Facility

Customs control is conducted during import and exports operations. Currently there is only import customs clearance and control at Modjo. The share of container to be physically controlled by destuffing is currently around 40%. These are the container catogorized 'red' by the customs risk management system. As the destuffing due to customs control needs more space than destuffing for dispatch of cargo in smaller units, suitable parameters for calculating the required space have been used. The Ethiopian Conformity Assessment Enterprise in involved primarily in imports and can be located in the same area as the Customs Inspection Facility. The following table shows the space requirements for physical customs check.

Table 54: Space Requirements Customs Inspection Facility

		2022	2025	2030	2035	2040	2043
Customs Inspection							
Annual import containers	**TEU**	193,645	255,947	331,172	427,570	506,231	538,992
Inspection percentage	**%**	40%	35%	30%	20%	20%	20%
Annual Inspection containers	**TEU**	77,458	89,582	99,351	85,514	101,246	107,798
Peak	**#**	1.2	1.2	1.2	1.2	1.2	1.2
Daily containers peak	**TEU/d**	255	295	327	281	333	354
Duration Inspection	**h**	6	6	6	6	6	6
Operating hours/day	**h**	14	14	14	14	14	14
Container per slot/day	**#**	2	2	2	2	2	2
Space per TEU Inspection	**sqm**	130	130	130	130	130	130
Gross/net factor		2	2	2	2	2	2
Space Inspection Import	**sqm**	33,105	38,287	42,463	36,548	43,272	46,073
Annual export containers	**TEU**	2,667	5,048	41,072	97,967	169,612	215,058
Inspection percentage	**%**	40%	35%	30%	20%	20%	20%
Annual Inspection containers	**TEU**	1,067	1,767	12,322	19,593	33,922	43,012
Peak	**#**	1.2	1.2	1.2	1.2	1.2	1.2
Daily containers peak	**TEU**	4	6	41	64	112	141
Duration Inspection	**h**	6	6	6	6	6	6
Operating hours/day	**h**	14	14	14	14	14	14
Container per slot/day	**#**	2	2	2	2	2	2
Space per TEU Inspection	**sqm**	130	130	130	130	130	130
Gross/net factor		2	2	2	2	2	2
Space Inspection Export	**sqm**	456	755	5,266	8,374	14,498	18,383
Total Inspection	**sqm**	**33,561**	**39,042**	**47,729**	**44,923**	**57,771**	**64,456**
Thereof							
Existing Area	*ha*	*3.4*	*3.9*	*4.8*	*4.5*	*5.8*	*6.4*
New Extension Area	*ha*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*

Source: Based on data from EMAA, market survey, international benchmark

Currently the customs service is available 14 hours per day. This is assumed being the operations hour for customs during the whole projection period. The time needed to check one container completely is assumed taking six hours which is a quite conservative assumption when taking this for the complete projection period. Although the operational parameters are taken being constant the percentage of cargo being categorized 'red' is assumed to decrease from currently 40% to 35% in 2025, 30% in 2030, and 20% from 2035 on. The required space can completely covered by the existing warehouse and customs control area of Modjo Dry Port. As two additional shed will be constructed as discussed during several meetings, the space is sufficient to cover all customs check requirements.

4.10 Further Facilities

4.10.1 Intermodal Facility

Beside truck operations, container trains coming from Djibouti are also handled at Modjo Dry Port. The current rail yard area provides four tracks with an operational length of 250 m each. The four tracks are arranged in two rail-sections with two tracks each. One rail-mounted gantry crane (RMG) is placed over one of the sections. But the RMG is currently not in operation due to technical breakdown[31]. Hence, the incoming trains are unloaded and loaded with reach stackers. The trains have a total length of up to 750 m. That's why they have to be uncoupled and distributed to three 250 m tracks. The unloading of a complete train currently takes around 3 hours. A complete train has a capacity of maximum 106 TEU.

[31] Information gathered verbally during an on-site visit at Modjo on 17th Nov. 2018.

Figure 23: Current Location of the RMG Rail Yard Crane

Source: SELLHORN-HPC 2018

The rail connection of MGLH is a real advantage and very much requested by the market. Railway transport is supposed to reduce transit time and increase the level of security as it is much more difficult to open a container on a train than on a truck. The following table shows the calculation for the required rail infrastructure to cover the container volume to be transported by rail. The yellow marked parameters in the following table are assumptions based on whether market survey or international benchmark.

For the extension of the current rail yard it is recommended to extend one of the currently two rail section to 750 m. The width of the existing RMG portal facilitates the construction of in total six rail tracks within the portal. The following operational parameters assume an operation of one RMG over six rail tracks in 2022 ending up in having seven RMG over six tracks in operations in 2043. It is recommended to build all tracks at once and to extend the whole rail yard already until 2022 as construction works in the future would remarkably disturb rail operations.

Table 55: Infrastructure Requirements for Intermodal Facility

		2019	2020	2021	2022	2025	2030	2035	2040	2043
Container										
Volumes in	**TEU**	144,736	159,653	175,956	193,645	255,947	331,172	427,570	506,231	538,992
Rail Share in	**%**	30.00%	30.00%	30.00%	30.00%	40.00%	50.00%	70.00%	70.00%	70.00%
Peak factor in		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Volumes out	**TEU**	139,274	153,869	169,846	187,213	248,608	324,195	421,842	503,362	538,453
Rail Share out	**%**	30.00%	30.00%	30.00%	30.00%	40.00%	50.00%	70.00%	70.00%	70.00%
Peak factor out		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Units/train	**TEU**	106	106	106	106	106	106	106	106	106
Backloading percentage	**%**	80%	80%	80%	80%	80%	80%	80%	80%	80%
Days per year	**#**	365	365	365	365	365	365	365	365	365
Trains per day	**#**	***2***	***2***	***2***	***2***	***4***	***6***	***11***	***13***	***13***
Handling duration per train	**h**	6	6	6	6	6	6	6	6	6
Admin (non productive time per train)	**h**	1	1	1	1	1	1	1	1	1
Total hours train operation per day	**h**	14	14	14	14	28	42	77	91	91
Maximum track occupancy	**%**	70%	70%	70%	70%	70%	70%	70%	70%	70%
Total tracks containers	**#**	***1***	***1***	***1***	***1***	***2***	***3***	***5***	***6***	***6***
Thereof										
Existing Area	*ha*	*10.0*	*10.0*	*10.0*	*10.0*	*10.0*	*10.0*	*10.0*	*10.0*	*10.0*
New Extension Area	*ha*	*0.0*	*0.0*	*0.0*	*5.5*	*5.5*	*5.5*	*5.5*	*5.5*	*5.5*

Note: Years 2019-2021 are referring to the existing intermodal rail facility.

Source: Based on data from EMAA, EDR, ESLSE, market survey, international benchmark

The railway spur into the container yard will need to be extended to cover the new container volumes. The table above shows, that in the beginning one 750 m track would be necessary only; assumed that the rail share for incoming full container is 30% and the outgoing full and empty container have also a rail share of 30%. Over the years this rail share is increasing and reaches its maximum with 70% from 2035 on. At the end of the projection phase six tracks of a length of 750 each are required.

Figure 24: Current Rail Loading and Unloading Operations

Source: HPC 2018

The figure above shows current rail operations for loading and unloading of container trains. Containers are unloaded from and loaded on the train by a heavy lift fork lift (like in shown in the figure above) or by reach stackers. Both operations require sufficient space (at least 20 m in width) at both side of the rail to enable the fork lift and reach stacker operations. This procedure could be retained in the first years of the MDLH but have to be changed later to RMG operations as this technology provides higher productivity (container moves per hour) than the reach stacker operations.

Table 56: Equipment Requirements for Intermodal Facility

Railway RMG		**2019 ***	**2020 ***	**2021 ***	**2022**	**2025**	**2030**	**2035**	**2040**	**2043**
Handling Volumes	'000 bx.	177.5	196.0	216.1	238.0	315.3	409.6	530.9	631.0	673.4
Railway Share	%	30%	30%	30%	30%	40%	50%	70%	70%	70%
Moves / Container	moves	1	1	1	1	1	1	1	1	1
Total Annual Moves	moves	53,252	58,786	64,838	71,411	126,139	204,803	371,618	441,697	471,383
Moves/RS p.a.	moves	60,000	60,000	60,000	85,000	85,000	85,000	85,000	85,000	85,000
Equipment Availability	%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Required RMG	**#**	**1**	**2**	**2**	**1**	**2**	**3**	**5**	**6**	**7**

Terminal Trucks	**2019 ***	**2020 ***	**2021 ***	**2022**	**2025**	**2030**	**2035**	**2040**	**2043**
Peak = Max Moves / h / Rail Handling Equip.	10	10	10	12	12	12	12	12	12
Number of Rail Handling Equipment	2	2	2	2	2	3	5	6	7
Round Trips / h / Terminal Truck	3	3	3	3	3	3	3	3	3
Equipment Availability	90%	90%	90%	90%	90%	90%	90%	90%	90%
Required Terminal Trucks	**8**	**8**	**8**	**9**	**9**	**14**	**23**	**27**	**32**

*: In the years 2019 -2021 reach stacker operations assumed

Source: Based on data from EMAA, EDR, ESLSE, market survey, international benchmark

The table above shows the requested number of container handling equipment to facilitate fluent rail operations. Until 2021 the use of reach stackers is assumed. This expressed by the annual moves per reach stacker of 60,000. From 2022 on the utilization of RMG is expressed by the annual movement of 85,000. The equipment availability 90% expresses, that each piece of equipment is 10% time under maintenance. Until 2021 the rail can be served by two exclusively used reach stackers. From 2022 one RMG is required. The number of RMGs increases up to seven in 2043.

In order to supply the rail operations the use of terminal tractor units is recommended as this is the cheapest and most suitable type of operations for MGLH. A reach stacker has a capacity of ten moves per hour and a RMG of twelve. It is expected that each truck-trailer unit conducts three 'round trips' per hour. A round trip means e.g. driving from the rail carrying an import container to its proposed position in the yard and returning to the rail RMG again (with or without loading container; depends on future operational system). Hence one round trip takes 20 min. In 2019 8 truck-trail units are required to supply the rail loading and unloading operations. This number increases to 32 in 2043.

4.10.2 Dry Bulk Rail Facility

For the identified potential of handling grain and fertilizer as dry bulk commodities at MGLH it is recommended to separate the container handling rail facility and the dry bulk handling rail facility, as they both have totally different operational requirements. As container rail cars are loaded and unloaded from above by the RMG the bulk hopper rail cars will be unloaded ad MGLH by the gravity discharging procedure, where the hopper opens hatches at the bottom to let the cargo drop down on a conveyor belt which is located at a certain palce under the rail infrastructure.

Table 57: Infrastructure Requirements for Grain Rail Facility

		2022	2025	2030	2035	2040	2043
Grain							
Volumes in	**tons**	377,585	468,415	572,520	679,693	785,380	846,010
Rail Share in	**%**	100%	100%	100%	100%	100%	100%
Peak factor in		1.2	1.2	1.2	1.2	1.2	1.2
Unit/train	**tons**	2,450	2,450	2,450	2,450	2,450	2,450
Days per year	**#**	365	365	365	365	365	365
Trains per day	**#**	***1***	***1***	***1***	***1***	***2***	***2***
Handling duration per train	**h**	5	5	5	5	5	5
Admin (non productive time per train)	**h**	2	2	2	2	2	2
Maximum track occupancy	**%**	70%	70%	70%	70%	70%	70%
Total tracks grain	**#**	1	1	1	1	1	1

Source: Based on data from EMAA, market survey, international benchmark

The tables for dry bulk handling show, that for the total projection period one track per commodity is sufficient. It is recommended to build two tracks from the very beginning even if two tracks are not fully utilized in the first years. This gives the dry bulk operations more flexibility and construction works in the future would be during high utilization of the one track and remarkably disturb the dry bulk rail operations. The assumed 5 hours needed for unloading a train give almost nine minutes for unloading of one rail car, which is a realistic and achievable dimension.

Table 58: Infrastructure Requirements for Fertilizer Rail Facility

		2022	2025	2030	2035	2040	2043
Fertilizer							
Volumes in	**tons**	521,072	656,535	769,143	874,608	965,123	1,009,126
Rail Share in	**%**	100%	100%	100%	100%	100%	100%
Peak factor in		1.2	1.2	1.2	1.2	1.2	1.2
Unit/train	**tons**	2,450	2,450	2,450	2,450	2,450	2,450
Days per year	**#**	365	365	365	365	365	365
Trains per day	**#**	***1***	***1***	***2***	***2***	***2***	***2***
Handling duration per train	**h**	5	5	5	5	5	5
Admin (non productive time per train)	**h**	2	2	2	2	2	2
Maximum track occupancy	**%**	70%	70%	70%	70%	70%	70%
Total tracks fertilizer	**#**	1	1	1	1	1	1

Source: Based on data from EMAA, ESLSE, market survey, international benchmark

The following table shows the required space for the calculated two dry bulk rail tracks. The gravity unloading procedures requires a track length which almost twice the length

of a complete train. This due to the fact, that the 'bunker' which is placed under the track comprising the conveyor belt for transporting the cargo to the storage area is located at a certain point (in the middle if whole track length) and facilitates the unloading of one railcar at a time. After the first wagon is unloaded the locomotive pushes the train forward in order to place the second railcar over the bunker and so on.

Table 59: Space Requirements for Dry Bulk Rail Facility

		2022	2025	2030	2035	2040	2043
Total tracks for dry bulk	#	**2**	**2**	**2**	**2**	**2**	**2**
Required Space	ha	**12.5**	**12.5**	**12.5**	**12.5**	**12.5**	**12.5**
Thereof							
Existing Area	*ha*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
New Extension Area	*ha*	*12.5*	*12.5*	*12.5*	*12.5*	*12.5*	*12.5*

Source: Based on data from EMAA, market survey, international benchmark

As it recommended building the dry bulk tracks separated from the container tracks, only space of the extension area will be used. In total 12.5 ha will be required for this construction. It includes the space covered by tracks and space on the side used for the rail track ballast (gravel) as well as a slope which will be necessary if the track is constructed at the north-western boundary of the extension plot.

4.10.3 In-Gate/Out-Gate Facility

The calculation for truck in- and out-lanes for the container as well as for the trucks approaching the future warehouse area (mentioned in the table below as 'other trucks') has to be calculated. It is assumed that the check procedure for incoming container trucks will be developed to take seven minutes per truck. The same applies for leaving/outgoing trucks.

Table 60: Volume-related Truck Gate Requirements

		2022	2025	2030	2035	2040	2043
Container trucks							
Trucks per hour	#	27	33	41	49	66	70
Paperwork Duration	min	7	7	5	5	5	5
Capacity per lane/h	trucks/h	9	9	12	12	12	12
Gate lanes full required		***4***	***4***	***4***	***5***	***6***	***6***
MT lanes		***1***	***1***	***1***	***1***	***1***	***1***
Total lanes each direction		***5***	***5***	***5***	***6***	***7***	***7***
Other trucks							
Trucks per hour	#	26	34	45	59	72	78
Paperwork Duration	min	15	15	10	10	10	10
Capacity per parking lot	trucks/h	4	4	6	6	6	6
Parking Lots		7	9	8	10	12	13
Access lane process duration	min	5	5	5	5	5	5
Capacity per Lane/h	trucks/h	12	12	12	12	12	12
Gate lanes full required		***3***	***3***	***4***	***5***	***6***	***7***
MT lanes		***1***	***1***	***1***	***1***	***1***	***1***
Total lanes each direction		***4***	***4***	***5***	***6***	***7***	***8***

Source: Based on data from EMAA, ESLSE, market survey, international benchmark

The process for in- and out-check of trucks delivering or picking goods from/to the warehouses and export consolidation centre is expected to take longer as the goods are not standardized like containers and the companies/people transporting the goods are probably not that experienced with dry port procedures. Both, for truck and other goods, the administrative procedures are expected to be optimized over the years and thereby shortened. In 2022 five lanes per direction (in total ten) are needed for container operations and four for 'other trucks' per direction (in total eight lanes). The numbers

increases until 2043 to seven lanes for container truck (in total 14 lanes) and to eight lane for ‘other trucks‘ (in total 16 lanes).

Table 61: Space Requirements for In-/Out-Gates

		2022	2025	2030	2035	2040	2043
Required Space per Lane	**sqm**	**275**	**275**	**275**	**275**	**275**	**275**
Container In-Gate Lanes	**#**	**5**	**5**	**5**	**6**	**7**	**7**
Container Out-Gate Lanes	**#**	**5**	**5**	**5**	**6**	**7**	**7**
Space for Container-Gate Lanes	**ha**	**0.28**	**0.28**	**0.28**	**0.33**	**0.39**	**0.39**
Other Truck In-Gate Lanes	**#**	**4**	**4**	**5**	**6**	**7**	**8**
Other Truck Out-Gate Lanes	**#**	**4**	**4**	**5**	**6**	**7**	**8**
Space for Other Trucks-Gate Lanes	**ha**	**0.22**	**0.22**	**0.28**	**0.33**	**0.39**	**0.44**
Total Lanes	**#**	**18**	**18**	**20**	**24**	**28**	**30**
Total Gate Space Required	**ha**	**0.50**	**0.50**	**0.55**	**0.66**	**0.77**	**0.83**
Thereof							
Existing Area	*ha*	*0.28*	*0.28*	*0.28*	*0.33*	*0.39*	*0.39*
New Extension Area	*ha*	*0.22*	*0.22*	*0.28*	*0.33*	*0.39*	*0.44*

Source: Based on data from EMAA, ESLSE, market survey, international benchmark

For each lane a space of 275 sqm is required. This space equals the roofed area of a gate facility including the net space needed for the truck itself, and some space for gate staff to surround the container/truck. The container-related gate lanes will be constructed on the area of the existing Modjo Dry Port and the gate lanes for ‘other trucks’ on the ground of the extension area.

4.10.4 Workshop and Container Repair Facility

A new workshop is currently under construction. The considered space for this new facility will be incorporated in the overall capacity calculation. The following figure shows an impression of the current workshop facility.

Figure 25: Current Situation at Existing Workshop

Source: HPC 2018

The new repair and maintenance workshop has a proposed ground space of 2.3 ha. This is assumed to provide sufficient workshop capacities for the total projection phase. As equipment repair partly needs same equipment and condition like container repair, it is recommended to locate the (empty) container repair facility adjacent to the workshop creating an area of three ha in total to cover both workshop and container repair. The following table shows the recommended space requirements for this facility.

Table 62: Space Requirements for Workshop and Container Repair

		2022	2025	2030	2035	2040	2043
New Workshop (under construction)	**ha**	2.3	2.3	2.3	2.3	2.3	2.3
Recommende Area for Container Repair	**ha**	0.7	0.7	0.7	0.7	0.7	0.7
Required Space for Workshop and Cont. Repair	**ha**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**
Thereof							
Existing Area	*ha*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
New Extension Area	*ha*	*3.00*	*3.00*	*3.00*	*3.00*	*3.00*	*3.00*

Source: Based on data from EMAA, ESLSE, market survey, international benchmark

Figure 26: Construction Site of New Workshop

Source: SELLHORN 2018

Services related to container handling offer good opportunities for further revenues. Hence, a mobile workshop car used for repairing full container on short notice to enable the transit of the container as soon as possible as well as a repair facility for empty damaged containers has to be provided.

4.10.5 Container Cleaning Facility

The cleaning of containers is one service that becomes quite important as a major part of the export volume consolidated via MGLH will be agricultural products supposed to be sold as food. Hence, the used containers for this kind of cargo have to cleaned or prepared for the transport of food. As containers are used for many different transport purposes it is likely that a certain share of empty containers available at MGLH have to be cleaned before transferred to the export consolidation centre.

Containers could be cleaned in several ways. If the interior of a container is only lightly dirty it might be enough to sweep it with a broom. For this service a bin for keeping the swept dust has to be provided at the cleaning centre. If the dust/dirt cannot be cleared with a broom probably a steam jet device or a high-pressure cleaner have to be used. For this case sufficient water supply as well as electricity is required. The container itsalef has to be placed on a space providing a used water tank in order to separate the arising dirty water from the regular sewage or rain water drainage. The following table shows the space requirements for a container cleaning facility at MGLH.

Table 63: Space Requirements for Container Cleaning Facility

		2022	2025	2030	2035	2040	2043
Full Export Container	**'000 TEU**	2.7	5.0	41.1	98.0	169.6	215.1
Share of Related Empties to be Cleaned	**%**	5%	10%	15%	15%	20%	20%
Space Required per Cleaning	**sqm**	65	65	65	65	65	65
Container Cleanings per Day	**TEU**	1	2	17	41	93	118
Required Space for Workshop and Cont. Repair	**ha**	**0.01**	**0.01**	**0.11**	**0.27**	**0.60**	**0.77**
Thereof							
Existing Area	*ha*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
New Extension Area	*ha*	*0.01*	*0.01*	*0.11*	*0.27*	*0.60*	*0.77*

Source: Based on data from EMAA, ESLSE, market survey, international benchmark

The average space of 65 sqm required for cleaning one container includes the net space for placing the container as well as additional space for reach stacker or forklift operations and industrial effluent separator. In 2022 a small space of 65 sqm is required which increases to almost 800 sqm in 2043.

4.10.6 Weigh Bridge

A weighing bridge is currently under construction on the existing Modjo Dry Port area. The required space for a weigh bridge includes the net area for the weigh bridge itself and additional area for approaching the facility. The net space is based on market compliant weigh bridges as well as standard gross/net factor. The following table shows the space requirements. By 2030 an additional weigh bridge might be needed. That's is why there is an increase in space from 600 sqm to 1,200 sqm.

Table 64: Space Requirements for Weigh Bridge

		2022	2025	2030	2035	2040	2043
Weigh Bridge Net Space	**sqm**	200.0	200.0	200.0	200.0	200.0	200.0
Number of Weigh Bridges	**#**	1.0	1.0	2.0	2.0	2.0	2.0
Gross/net factor		3	3	3	3	3	3
Required Space for Weigh Bridge	**sqm**	**600**	**600**	**1,200**	**1,200**	**1,200**	**1,200**
Thereof							
Existing Area	*ha*	*0.06*	*0.06*	*0.12*	*0.12*	*0.12*	*0.12*
New Extension Area	*ha*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*

Source: Based on data from EMAA, ESLSE, market survey, international benchmark

4.10.7 Security Facilities

MGLH has to provide facilities that serve the purpose of security. These facilities are mainly watch towers and a continuous fencing or wall construction to prevent unauthorized individuals to enter the MGLH plot. Regarding 'security' the previously mentioned in-gate and out-gate facilities also play an important role as they are the only point of entry or exit especially for vehicles. It is recommended to have at least one additional entry point for staff entering the plot without a vehicle. This entry is supposed to be close to administration building on the current Modjo Dry Port area in the south western corner. In order to prevent to have too many pedestrians on the facility an internal bus shuttle service should be implemented mainly operating during the periods of changing of the shifts on a schedule basis and on demand during the rest of the day.

The following figure shows an existing watchtower at Modjo Dry Port and the encircling wall on the western side of the plot.

Figure 27: Watchtower and Fencing Facility of Modjo Dry Port

Source: HPC 2018

The total length on an encircling facility whether a fence or a wall is about 5.5 km. The already existing facilities (e.g. as shown in previous figure) could be incorporated. Currently three watch towers exist. They are located at the western boundary of the existing Modjo Dry Port plot. These towers are built with a distance of around 200 m to each other. Keeping this distance and assuming that the southern boundary where the plot is adjacent to the main road and providing the in- and out-gate lanes less towers are required in total 20 watch towers are required. The following figure shows a sketch of the location of the watch towers.

Figure 28: Proposed Security Facility

Source: HPC 2018 based on Google Earth

Each watch tower has a ground space of around 50 sqm. In addition to the tower a security office of about 200 sqm is planned. The following table shows the space requirements for security facilities. In total 0.12 ha are required. It is recommended to build all security facilities at the very beginning.

Table 65: Space Requirements for Security Facilities

		2022	2025	2030	2035	2040	2043
Space per Watch Tower	**sqm**	**50**	**50**	**50**	**50**	**50**	**50**
Required Watch Towers	**#**	**20**	**20**	**20**	**20**	**20**	**20**
Space for Security Admin.	**sqm**	**200**	**200**	**200**	**200**	**200**	**200**
Required Space for Watch Towers and Admin.	**ha**	**0.12**	**0.12**	**0.12**	**0.12**	**0.12**	**0.12**
Thereof							
Existing Area	*ha*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*
New Extension Area	*ha*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*

Source: Based on data from EMAA, ESLSE, market survey, international benchmark

The entrance for trains, which should provide a physical gate to be closed if rail operations stop for longer (e.g. public holiday or similar), should be supervised by a CCTV closed circuit television system. This replaces the opening and closing of a physical gate for each entry or leaving of train, which would be otherwise quite time consuming for train operations.

4.10.8 Emergency Control Centre and Fire Brigade

The current fire brigade has to be moved to a central location within the MGLH plot. This new facility should be combined with the emergency control centre. The following figure shows the current fire brigade station.

Figure 29: Current Fire Brigade Station

Source: HPC 2018

The space requirements for the emergency control centre are assumed being constant for the whole projection phase. The control centre mainly consists out of office and staff room (locker rooms). A building for housing the fire fighting vehicles as well as the equipment needed. Further equipment is also required for several emergency situations. This is stored in the facility, too. The following table shows the space requirements. By 2022 around 860 sqm are required, It is assumed that additional equipment will be purchased by 2030 and therfor more space is required. Hence, by 2030 around 960 sqm are required.

Table 66: Space Requirements for Emergency Control Centre and Fire Fighting Department

		2022	2025	2030	2035	2040	2043
Emergency Control Center	**sqm**	200.0	200.0	200.0	200.0	200.0	200.0
Fire Fighting Department	**sqm**	640.0	640.0	760.0	760.0	760.0	760.0
Required Space	**sqm**	**840**	**840**	**960**	**960**	**960**	**960**
Thereof							
Existing Area	*ha*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
New Extension Area	*ha*	*0.08*	*0.08*	*0.10*	*0.10*	*0.10*	*0.10*

Source: Based on data from EMAA, ESLSE, market survey, international benchmark

4.10.9 Parking Space

According to the incoming truck calculations of required parking space for container and other trucks of MGLH were conducted. These parking slots are located close to the in-gate facility on the existing dry port area and the extension area. It is assumed that 100% of trucks handled in one hour are using a parking space as it is quite unlikely that they arrive 'just in time' to be processed immediately. Hence, they have to wait until being processed.

Table 67: Space Requirements for Truck Parking

		2019	2020	2021	2022	2025	2030	2035	2040	2043
Incoming Trucks per Peak Hour	#	22	24	27	53	67	86	108	138	148
Share of waiting trucks	%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Gross Space per Parking Slot	sqm	150	150	150	150	150	150	150	150	150
Required Space for Truck Parking	ha	**0.33**	**0.36**	**0.41**	**0.80**	**1.01**	**1.29**	**1.62**	**2.07**	**2.22**
Thereof										
Existing Area	*ha*	*0.33*	*0.36*	*0.41*	*0.44*	*0.50*	*0.58*	*0.73*	*0.93*	*1.00*
New Extension Area	*ha*	*0.00*	*0.00*	*0.00*	*0.36*	*0.50*	*0.71*	*0.89*	*1.14*	*1.22*

Source: Based on data from EMAA, ESLSE, market survey, international benchmark

Based on international benchmark measures, each truck parking slot requires an area of 150 sqm including net parking space per truck and space for entering and leaving the slot. In

4.10.10 Green Area and Recreation Area

The green area will comprise greenery, avenue plantation, and trees: Especially trees offer excellent protection against visibility, dust and noise. Therefore the prevailing wind direction should be taken into account when planting trees, and/or planting should take place between the dry port and the nearest settlements. Avenue plantation most probably refers to the driving lanes inside the dry port. Roads are planned considering space for trees and bushes to be planted. Trees are also ideal shade providers and should therefore preferably be planted in areas where cantina is.

Table 68: Space Requirements for Green and Recreation Area

		2022	2025	2030	2035	2040	2043
Total Area	**ha**	120	120	120	120	120	120
Recommended Share for Green	**%**	5%	5%	5%	5%	5%	5%
Required Space for Green and Recreation	**ha**	**6.00**	**6.00**	**6.00**	**6.00**	**6.00**	**6.00**
Thereof							
Existing Area	*ha*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
New Extension Area	*ha*	*6.00*	*6.00*	*6.00*	*6.00*	*6.00*	*6.00*

Source: Based on data from EMAA, ESLSE, market survey, international benchmark

Based on international standards a minimum of 5% of total space should be converted into ‘green area’. The recreation areas will be combined with green area and should be decentralized. Hence it could be approached easily by the MGLH employees. The green recreation area will be established only for MGLH employees and is not recommended to be accessible for public as this does not comply with the security approach. For the whole projection phase around 6 ha of green area are assumed.

4.10.11 Regulatory Offices, Service Centre and Administration Facilities

The availability of banking, insurance and shipping line/freight forwarder services is essential for the provision of a fluent cargo handling flow. The specific services have to be located close to the commodities handling areas. In the previous sections it has already be recommended to establish a central service centre or at least commodity-orientated service-clusters. For some commodities very unique services are required, especially when it comes to quality testing. Other more general service should be located at a central place within MGLH.

The regulatory agencies involved in clearing of exports like quality, phyto-sanitary conditions of the container, Ministry of Trade and Industry approval of quality, etc. are considered to have offices in the export centre. The following figure shows an impression of the current service centre at Modjo Dry Port.

Figure 30: Example of a Current Freight Forwarder Office

Source: HPC 2018

A new administration building is currently under construction. Further administration facilities have to be provided in the export consolidation area. This building is located at the south-western corner of the existing Modjo Dry Port area. It is supposed to cover a space of around 4.5 ha which includes some open space around the building.

The current area of the dry port where all the mentioned services are located utilizes space of approximately 1.5 ha. But it has to be considered that this area includes also parts of the workshop, the cantina, and dry port administration offices.

The following table shows an overview of expected space requirements for additional services, regulatory offices and the administration building currently. The previously discussed laboratory facility for the CLU is expected to require a space of 3,000 sqm by 2022 in order to be increased by 2035 by additional 1,000 sqm. This has been discussed with representatives of CLU. It will be a newly build and additional facility to the already existing one at Addis Ababa. The required total space for services sums up to 1.22 ha on the extension area and .45 ha on the existing Modjo Dry Port plot. Due to additional space needed for the laboratory as well as additional services providers to be expected to join the MGLH service centre 1.52 ha are required by 2035 on the extension area.

Table 69: Space Requirements for Regulatory, Services and Administration.

		2022	2025	2030	2035	2040	2043
Banking Services	#	3.0	4.0	4.0	4.0	4.0	4.0
Required size each per unit	sqm	100	100	100	100	100	100
Sub-Total Banking	sqm	300	400	400	400	400	400
Insurance Services	#	2.0	3.0	3.0	3.0	3.0	3.0
Required size each per unit	sqm	100	100	100	100	100	100
Sub-Total Insurance	sqm	200	300	300	300	300	300
Shipping Lines / Freight Forwarders		4.0	5.0	6.0	6.0	6.0	6.0
Required size each per unit	sqm	150	150	150	150	150	150
Sub-Total Shipping	sqm	600	750	900	900	900	900
Laboratory		1.0	1.0	1.0	1.0	1.0	1.0
Required size each per unit	sqm	3,000	3,000	3,000	4,000	4,000	4,000
Sub-Total Laboratory	sqm	3,000	3,000	3,000	4,000	4,000	4,000
Regulatory Agencies		5.0	5.0	5.0	5.0	5.0	5.0
Required size each per unit	sqm	400	400	400	400	400	400
Sub-Total Regulatory	sqm	2,000	2,000	2,000	2,000	2,000	2,000
Sub-Total Net Total	sqm	6,100	6,450	6,600	7,600	7,600	7,600
Gross/net factor		2.0	2.0	2.0	2.0	2.0	2.0
TOTAL Space Requirements	sqm	**12,200**	**12,900**	**13,200**	**15,200**	**15,200**	**15,200**
Administration Building under construction (incl. surounding)	sqm	4,500	4,500	4,500	4,500	4,500	4,500
Thereof							
Existing Area	*ha*	*0.45*	*0.45*	*0.45*	*0.45*	*0.45*	*0.45*
New Extension Area	*ha*	*1.22*	*1.29*	*1.32*	*1.52*	*1.52*	*1.52*

Source: Based on data from EMAA, ESLSE, market survey, international benchmark

4.10.12 Cantina

The current cantina located close to the administration shed at Modjo covers a space of approximately 75 sqm. As more employees will be working at MGLH a larger and partly decentralized service will be required. The following figure shows an impression of the current cantina facility.

Figure 31: Current Cantina Facility

Source: HPC 2018

The size of cantina capacity is very much related to the number of total staff, the share of employees really using cantina services and the size of time window per shift employees are allowed to take a break. The requirements of cantina size differ remarkably if e.g. 200 people are having lunch almost at the same time or if they are distributed within a three hours time window. Hence the following table considers these conditions.

Rough estimation of total staff is related to number handled container and the ratio of employees to container numbers in 2017 (=1.9 staff per throughput TEU. By 2022 it is expected that twice the people per throughput TEU are working within MGLH, knowing that this is just a rough approach. Assuming that more people are working in morning and day shift than in the night shift, the total number of staff is divided by 2.5 (and not three shifts).

The space needed per guest in cantina is 1.25 sqm for sitting. The gross/net factor is 5, expressing that additional space for kitchen, serving counter, etc. is required beside the actual lunch room.

Table 70: Space Requirements for Cantina Facility

		2022	2025	2030	2035	2040	2043
Container Throughtput	**'000 TEU**	381	505	656	850	1,010	1,078
Staff	**#**	1,475	1,954	2,538	3,290	3,910	4,173
Staff per Throughput TEU		3.9	3.9	3.9	3.9	3.9	3.9
Expected Staff per Break Period	**#**	590	782	1,015	1,316	1,564	1,669
Share of Cantina Users	**%**	60%	60%	60%	60%	60%	60%
Staff per Break period in Cantina	**#**	354	469	609	790	938	1,002
Gross Space required	**sqm**	553	733	952	1,234	1,466	1,565
Thereof							
Existing Area	*ha*	*0.01*	*0.02*	*0.02*	*0.03*	*0.04*	*0.04*
New Extension Area	*ha*	*0.04*	*0.05*	*0.07*	*0.09*	*0.11*	*0.12*

Source: Based on data from EMAA, ESLSE, market survey, international benchmark

It is expected that the cantina facility on the existing Modjo Dry Port area will bemoved to the new administration building. The larger cantina capacity will be required in the warehouse and export consolidation centre. This might not result in one large facility but several well located cantina units. By 2022 around 500 sqm are required for cantina services. This will increase to 1,500 sqm in 2043.

4.11 Summary of Space Requirements

In the following table the calculated required spaces are summarized. Space requirements are distributed to existing Modjo Dry Port area and extension area. Already in 2022 more than half of the extension area is recommended to be developed. Especially the development of the rail infrastructure facilities is recommended to be built in the very beginning of the MGLH development as later on construction areas in these sections would disturb the cargo and train handling operations remarkably.

Especially by improvement of the container handling regarding space efficiency space could be 'gained' on the existing Modjo Dry Port area, which is proposed to be used form 2030 on as additional space for general cargo.

The space requirements for exports goods might appear small. But these dimensions are mainly impacted by the very short dwell time of goods. If these short dwell times will not be reached, the attractiveness of MGLH for exporters is reduced distinctly as they are looking for a solution improving the current situation.

Calculation shows, that the current warehouse facilities on the Modjo Dry Port plot would be sufficient to serve as customs area for the whole MGLH. Assuming that two additional sheds are constructed as planned.

The space requirements for internal roads to facilitate access to the plots, facilities and units is currently not considered in the table but expected to reach a size of 5 – 10 ha. The detailed space requirements for roads will be elaborated in the next report.

In 2022 almost 100 ha are required to cover the expected business opportunities. The space of existing Modjo Dry Port plot is utilized by only 38 ha calculation-wise as the customs area is not utilized completely (but constructed) and as mentioned abpve roads are currently not included.

By the end of the projection phase in 2043 the complete area needed sums up to 150 ha.

Table 71: Overview of Space Requirements

all in ha / *Area used* / *Facilities*		2022		2025		230		2035		2040		2043	
		exisiting dry port	new extension	exisiting dry port	new extension	exisiting dry port	new extension	exisiting dry port	new extension	exisiting dry port	new extension	exisiting dry port	new extension
Major Facilities													
Container		23.2	3.5	25.1	4.7	21.5	5.0	18.9	5.6	12.8	5.6	12.1	5.1
Import Deconsolidation		0.0	9.0	0.0	13.3	0.0	15.3	0.0	19.8	0.0	23.4	0.0	24.9
Grain		0.0	2.2	0.0	2.8	0.0	3.4	0.0	4.0	0.0	4.6	0.0	4.9
Fertilizer		0.0	5.6	0.0	5.7	0.0	6.0	0.0	5.9	0.0	6.5	0.0	6.8
General Cargo		0.0	5.0	0.0	8.3	5.0	6.9	5.0	10.8	10.0	9.3	10.0	11.1
Vehicles		0.0	4.9	0.0	5.7	0.0	10.0	0.0	12.9	0.0	16.0	0.0	16.8
Export Consolidation	**Coffee**	0.0	0.2	0.0	0.3	0.0	0.7	0.0	1.0	0.0	1.4	0.0	1.7
	Oilseeds	0.0	0.6	0.0	0.9	0.0	1.1	0.0	1.7	0.0	2.5	0.0	3.0
Cold Storage	**Fruits**	0.0	0.1	0.0	0.1	0.0	0.2	0.0	0.3	0.0	0.5	0.0	0.6
	Vegatables	0.0	0.4	0.0	0.7	0.0	1.1	0.0	1.6	0.0	2.2	0.0	2.8
Customs Inspection		3.4	0.0	3.9	0.0	4.8	0.0	4.5	0.0	5.8	0.0	6.4	0.0
Sub-Total Major Facilities		**26.6**	**31.5**	**29.1**	**42.6**	**31.3**	**49.7**	**28.4**	**63.6**	**28.6**	**72.1**	**28.6**	**77.7**
		58.1		**71.7**		**80.9**		**92.0**		**100.7**		**106.3**	
Further Facilities													
Intermodal Facility		10.0	5.5	10.0	5.5	10.0	5.5	10.0	5.5	10.0	5.5	10.0	5.5
Dry Bulk Rail Facility		0.0	12.5	0.0	12.5	0.0	12.5	0.0	12.5	0.0	12.5	0.0	12.5
In-/Out Gate Container & Other Trucks		0.3	0.2	0.3	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4
Workshop and Container Repair		0.0	3.0	0.0	3.0	0.0	3.0	0.0	3.0	0.0	3.0	0.0	3.0
Container Cleaning		0.0	0.01	0.0	0.01	0.0	0.11	0.0	0.27	0.0	0.60	0.0	0.77
Weigh Bridge		0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0
Security Facility		0.02	0.1	0.02	0.1	0.02	0.1	0.02	0.1	0.02	0.1	0.02	0.1
Emergency Control Center and Fire Fighting		0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1
Parking Space		0.4	0.4	0.5	0.5	0.6	0.7	0.7	0.9	0.9	1.1	1.0	1.2
Green and Recreation Area		0.0	6.0	0.0	6.0	0.0	6.0	0.0	6.0	0.0	6.0	0.0	6.0
Regulatory Offices, Service Centre and Admin.		0.5	1.2	0.5	1.3	0.5	1.3	0.5	1.5	0.5	1.5	0.5	1.5
Cantina		0.01	0.04	0.02	0.05	0.02	0.07	0.03	0.09	0.04	0.11	0.04	0.12
Sub-Total Further Facilities		**11.3**	**29.0**	**11.3**	**29.3**	**11.5**	**29.7**	**11.7**	**30.3**	**11.9**	**31.0**	**12.0**	**31.3**
Total MGLH		**37.8**	**60.5**	**40.4**	**71.9**	**42.7**	**79.4**	**40.1**	**93.9**	**40.6**	**103.1**	**40.6**	**109.0**
		98.4		**112.3**		**122.1**		**134.0**		**143.6**		**149.5**	

Source: Based on data from EMAA, market survey, international benchmark

Beside the overall space requirement planning also average sizes for commodity-related facility units can be indicated. By the comprehensive market survey conducted during the elaboration of this report suitable sizes have been defined by interview partners. The following table shows an indicative distribution of in total needed space to certain plots.

Table 72: Distribution of Units Size for Specific Facilities

		2022	2025	2030	2035	2040	2043
Import Deconsolidation	required space [ha]	8.95	13.31	15.31	19.77	23.40	24.92
Processing units of	20,000 sqm each	5	7	8	10	12	13
Coffee	required space [ha]	0.18	0.33	0.70	1.04	1.45	1.71
Processing units of	3,000 sqm each	1	2	3	4	5	6
Oilseeds	required space [ha]	0.58	0.93	1.13	1.73	2.48	3.01
Processing units of	5,000 sqm each	2	2	3	4	5	7
Fruit (cold storage)	required space [ha]	0.07	0.12	0.21	0.32	0.47	0.59
Processing units of	4,000 sqm each	1	1	1	1	2	2
Vegetables (cold storage)	required space [ha]	0.41	0.72	1.08	1.58	2.25	2.75
Processing units of	5,000 sqm each	1	2	3	4	5	6

Source: Based on data from EMAA, market survey, international benchmark

The recommended unit size for import deconsolidation units of 20,000 sqm each is compared to the other unit sizes quite large. In 2022 it is expected to have a demand for 5 of these units. The number is increasing steadily in order to reach 13 in 2043.

The recommended size for coffee processing units are defined by 3,000 sqm each, for oilseeds of 5,000 sqm, for fruits of 4,000 and for vegetables of 5,000 sqm. As for all commodities an increase in cargo volume is forecasted within the projection period also the number of required units is increasing.

Different units may also indicate different operators and provide a range of number of possibly involved stakeholders. Just summing up the identified number of units in 2043 34 operators might be active in MGLH.

4.12 Prioritizing of Facility Development

It is recommended to build required facilities in a way that they cover the capacity of at least the upcoming five years. A detailed phasing of the construction will be elaborated in the Component 2 Report but at this point already some indications can be given which of the facilities are recommended to be constructed earlier or later within the project period. It also has to be considered that additional capacities are need at a time when the utilization of existing capacities is high. Hence, expected traffic and operational activities at the facilities are expected to be high, where a construction area is highly inconvenient. This implies that constructed capacities should cover several years and the development of plots should provide reasonable expansion area per facility type.

As one of the objectives of MGLH is the involvement of private parties and operators, it is recommended to construct the facilities required for the export consolidation with a capacity expected to be required for 2025 – 2030. If during or even better before start of construction phase contracts or memorandums of understanding can be concluded with future users of the facilities the required capacities can even be phased more customized to the needs of the private operators. The more binding agreements could be concluded in advance the better the phasing can be planned.

Mainly due to restricted storage height for empty container (currently only 3 high) and full container (currently 4 high) the forecasted container volumes require a more space efficient storage under RTG from 2022 on. Although the currently high dwell times of around 60 days are expected to decrease to 25 days in 2022 the implementation of more efficient container storage is recommended. As shown in the container facility requirements table 50% of the full containers have to be stored under RTG which is designed to store 6 high. This RTG storage has to be placed on a newly prepared area which is capable of this load. Therefore also a new container area at the east side of the current container yard has to be prepared within the first development phase.

It is also recommended to start construction of one dry bulk facility. As the construction of the planned fertilizer plant in Dire Dawa is not ensured probably discussion should be conducted on authority management level to get a valid picture of the implementation plans. As both commodities, fertilizer and grain, are procured by public entities, volume ensuring agreements could be concluded. Hence, at least the grain dry bulk facility has to be considered during preparation of the first development phase. This includes the construction of the two dry bulk rail tracks leading close to the dry bulk storage and bagging area. As for gravity unloading is planned for both of the dry bulk commodities

a track twice the length of a complete train is required. Details are described previously under dry bulk facility the locations where to install these tracks is limited.

It is also necessary to locate and construct the gate facilities in the first phase as well the internal roads at least those leading to the locations of the first export consolidating plots and dry bulk facilities.

4.13 Matching Investment Plan

As said, an area of 120 hectares in addition to the existing Modjo Dry Port (which has an area of 63 hectares) has been chosen to be the location of the Green Logistics Hub. Sufficient space is available to create a common use area with a variety of new services in addition to dry port services (customs clearance) already been offered at Modjo Dry Port. A portfolio of demand-based and required services will be provided in section 5.1.3. This actual section focuses on figuring out strategies for attracting investments at MGLH. Furthermore the competitiveness of MGLH will be discussed in terms of how it fits in the wider geographical and physical system and how investments in Djibouti and other strategic important locations (Port in Eritrea might gain some more additional volume due to the end of the civil war) affect development and required investments at MGLH.

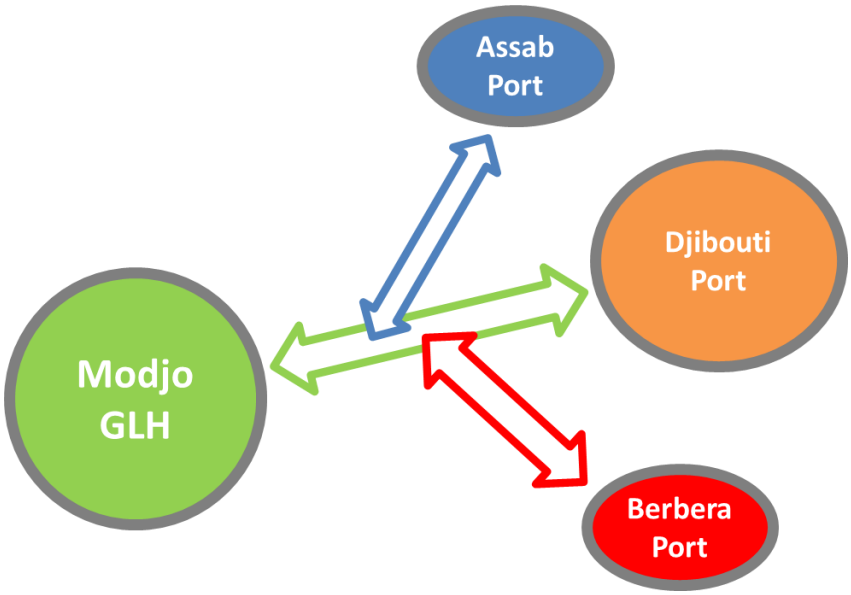
4.13.1 Competitiveness of the Green Logistics Hub

It is vital to see MGLH as one of multiple single actors being part of an integrated Hub and Spoke System. As Ethiopia is a landlocked country, Djibouti is the major port for its import and export cargo. Even though ports in Eritrea (Asseb and Massawa) might play a more important role in the future, due to the fact that Ethiopia and Eritrea declared end to their "state of war", a two-decade-long standoff that followed a brutal war over their shared border, Djibouti will remain the most important port for Ethiopia. The port's draft of 18 meters as well as state of the art superstructure developed by DP World, ensure a high quality port handling of containers and other types of cargo. Due to high importance of Djibouti, substantive changes, like the installation of a new terminal, have significant impacts to MGLH. The Government of Djibouti has terminated the agreement with DP World and is now handling the container terminal. The name is now Société de Gestion de Terminal á Conteuneur de Doraleh (SGTD).

Modjo is well located right in the centre of the country 58 km southeast of Addis Ababa District and 852 km from Djibouti. Especially coffee, which is mainly harvested in the

centre and south of the country[32] is a target product, which is ideal to be handled through Modjo in the future. Most coffee exporters operate from Addis Ababa.

Figure32: Scheme of Hub Function of MGLH



Source: HPC 2018

Modjo is located very close to Addis Ababa, the capital city of Ethiopia. The fact that numerous exporters and manufacturing companies are located around Addis makes Modjo a highly appropriate location for transferring services and operations currently being done at Addis to Modjo.

4.13.2 Investments in Djibouti Port

As said, MGLH and Djibouti have to be considered as two of multiple actors of an integrated supply chain system. Change at one of these actors causes reaction and consequences at other actor's capacity requirements.

Acc. to World Bank Logistics Performance Index (LPI) the efficiency of the Doraleh Container Terminal of 34 moves per hour per crane is one of the strongest in Africa. It has increased 32% in the first half of 2018[33]. The terminal itself is the centre of the

[32] Development of a National Logistics Strategy for Ethiopia, Nathan Associates Inc. issued 2014, Page 50

[33] https://www.porttechnology.org/news/djibouti_jumps_44_places_in_world_bank_rankings

Djibouti International Free Trade Zone (DIFTZ), which is according to port news the biggest free trade zone in Africa.

The new multipurpose terminal in Djibouti and the railway connection between Djibouti and Modjo, increase the quantity of cargo (bulk and breakbulk) being handled and transported. The railway doesn't currently extend all the way to Doraleh Multipurpose Port. (DMP) The Railway has made a temporary arrangement with a trucking firm for bringing cargo from DMP to their rail yard at Negad. Nevertheless, it is critical that the spur be built to DMP for efficient handling.

World Food Program has begun to use Berbera Port in Somaliland for most of their inbound food cargo. Many of their deliveries are to the Somali Region of Ethiopia making Berbera geographically advantageous. Berbera Port is adequate for their needs and the road is satisfactory. If too ships come at the same time, they direct them to SDTV, if they are available.

Currently there are two trains arriving from Djibouti at Modjo. Each train is 53 waggons long, which means that it either brings 53 x 40' containers or 106 x 20' containers or a combination of both. It is the future target to operate four trains arriving at Modjo.

The quantity of equipment, like forklifts and reach-stackers must be increased. Currently 6 out 9 reach stackers are working and additional 10 new reach stackers have been ordered. Furthermore it is mandatory to fix the gantry crane which has, compared to reach stackers, are much higher efficiency in terms of loading and unloading a train.

But not only containers stuffed with general cargo are target commodities to be arriving by train at Modjo. Also bulk cargo like fertilizers and grain are intended to arrive at Modjo by train for further handling though Silos and bagging and storage afterwards.

As already mentioned the GTP II defines among others one rail target of providing rail capacity capable for transporting 7.5 million tonnes of cargo per annum by 2020 on the Addis Ababa-Djibouti Corridor.

Figure 33: Capacity Label of a 40' Container Rail Car

Source: SELLHORN-HPC 2018

4.14 Promotion Strategy

The effect of developing a MGLH would be a regional advantage for the country and the region in which it is situated as well as for the City of Modjo itself. Besides socio-economic effects to nearby community, there are a number of benefits in terms of logistics handling procedures which should be attracting investments in Modjo. Based on the analysis, the consultant has identified that potential investors and stakeholders prefer pre-built facilities which they later could equip with their specific machinery, office rooms and further components. They will be encouraged to invest in Modjo once there is existing facilities in terms of space and design and infrastructure provided. Following players are meant by stakeholders:

- freight forwarders
- carriers
- shipping agents
- manufacturers and exporters
- customs brokers

- providers of additional services
- Ethiopian Associations

The aim is to create a certain awareness of a common use area where above mentioned stakeholders being part of the value added supply chain process find ideal conditions for doing efficient operations. Product-related advantages in terms of logistics handling procedures, which in the end, reduces the selling price on the market, need to be promoted and placed.

A significant advantage which stakeholders have figured out during consultant's interviews is the effect of economies of scale. Operational costs will be lowered by common use of equipment and labour. A forklift for a stuffing or un-stuffing a container can be used on demand, instead a buying one and generating fixed costs.

MGLH creates value by reducing the costs associated with the transportation, storage and distribution of goods from manufacturers and farmers to their clients all over the world, and thereby improving their competitiveness.

Attractive rent and cost models need to be provided as well as the creation of awareness that being part of a Green Logistics Hub campaign generates a good reputation.

In addition there are following theoretical benefits for stakeholders which should be aimed at MGLH:

- Guaranteed water and electricity availability
- Common waste and water disposal
- canteen
- Efficient and adequate logistics infrastructure → Economies of scale
- Ability to provide value added services at the hub
- Cost effective transfer of containerized cargo → increase of competitiveness
- Limited government intervention and bureaucracy
- Value-up company reputation by being part of Green logistics campaign

Incentives like providing land for a low price, facilitating bank loans with low interest, offering e.g. 10 years tax holidays, and allowing tax -free machinery imports, could attract foreign investors.

5. ENVIRONMENTAL AND SOCIAL ASPECTS

The establishment of MGLH by utilizing additional land adjacent to the existing Modjo Dry Port has an impact on the environmental as well as social condition within the plot itself and the periphery around it.

Ethiopia is signatory to a number of international Conventions and Agreements relating to natural protection and environmental management, climate change and greenhouse gas (GHG) reduction that need to be considered during construction and operation of the "Green Logistics Hub".

International Conventions and Agreements of relevance for the Project include:

- The United Nations Framework Convention on Climate Change, 1992
- The United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa
- Convention on Biological Diversity (CBD)
- The Vienna Convention for the Protection of the Ozone Layer
- Montreal Protocol on Substances that Deplete the Ozone Layer
- The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade
- The Basel Convention on the Control of Trans-boundary Movements of Hazardous Waste
- The Bamako Convention on the Control of Trans-boundary Movement and Management of Hazardous Wastes within AfricaThe Libreville Declaration on Health and Environment in Africa
- The United Nations Convention on International Trade in Endangered Species (CITES) of Wild Fauna and Flora 1973
- The United Nations Convention on Biological Diversity (Rio Convention) 1992

The following environmental and social impacts are to be expected:

1. When implementing option 3 (see chapter 2.1, figure 5), the hill north of the railway station will be removed in order to level the entire terrain. This will require extensive earth movements, however, it might facilitate container operations as all activities will take place at the same level.

Figure 34: Hill North of Railway Station

Source: HPC 2018

2. The extension area is still inhabited by 5-6 farming households which have to be relocated. This will be a severe negative social impact for the PAHs.

3. For all options it will be necessary to clear trees (see figure 20, red arrows).

Figure 35: Trees on Extension Area

Source: HPC

4. There is a temporary creek on the extension area. If this creek is filled in, this could have a negative effect on the water regime of the area (e.g. rainwater runoff).

Figure 36: Temporary Creek

Source: HPC

Other construction- and operation related impacts will be extensively dealt with in the AESIA and the corresponding ESMPs. In order to mitigate the impacts of aforesaid expected measures should be taken into account:

1. The advantages and disadvantages of a complete levelling of the site will carefully be weighed by the engineers and operational experts as well as by the financial experts in order to propose an optimal solution.

2. A fair resettlement and compensation plan will be drawn up for the people who have to leave the area. It will be the responsibility of EMAA to ensure that this plan is adhered to.

3. Compensatory plantation using local or native tree species will be carried out to replace the trees felled during the construction. In addition it is planned to plant a green belt and a recreation areas.

4. The course of storm- and rainwater will be carefully considered in the engineering planning. In consultation between engineers and environmental experts, the possibility of creating the green belt in places that are unfavourable for construction (e.g. the temporary creek) will also be reviewed. The best option will be presented to EMAA.

A detailed description of all mitigation measures to be implemented during construction and operation of MGLH will be subject to a AESIA and the corresponding ESMPs.

The adverse and beneficial impacts of the development of Modjo Dry Port into a modern and efficient "Green Logistics Hub" can be summarized from an environmental view as follows:

- To the maximum extent possible Modjo will be developed as a "Green Logistics Hub", i.e., clean and/or energy-saving processes and equipment are integrated in the planning process as far as possible;
- In the short-term the Project will have positive social impacts, e.g. on employment in the region by creating a demand for unskilled construction workers;
- In the long run the work force on the site is expected to double;
- Introduction of better health and safety management practices will contribute to improve the working environment;
- For removed trees, the Project will carry out compensatory plantation with locally available native tree species. This will serve several purposes - it will lessen dust generation, it will provide a better visual impact of the area as well as improved air quality, and in the long term the plantation would act as carbon sink.
- Operational mitigation measures will include best management practices (BMPs) and worker education.
- A follow-up and monitoring program will be implemented to verify whether required mitigation measures and commitments made through the regulatory approvals process were implemented. This applies in particular to the compensation for relocation
- Through the "Green Logistics Hub" concept environmental, economic and social benefits of the Project will be realized at the national, regional and local scale, such as:
    - Reduction of Ethiopia's greenhouse gas (GHG) emissions by use of more energy efficient intermodal services, as e.g. one intermodal train removes as many as 280 heavy long distance trucks from highways;
    - Construction of "green" building to reduce the demand on energy requirements (e.g., energy efficient building, use of rooftop solar panels);

- Planting of vegetation will increase vegetation diversity of the area, provide shade and act as a carbon sink;
- Creation of several 100 opportunities for employment (including direct jobs at the site, in addition to indirect and induced opportunities)
- Reducing congestion on the roads and highways
- Construction of houses for employees.

An more detailed view on the issues related to the environmental and social conditions to be impacted by the MGLH will be investigated in the upcoming reports of Pahse 1 of this project.

6. COST AND BENEFIT ANALYSIS

The establishment of MGLH provides several benefits having an impact not only on the hub and its stakeholders but also on the region as well as on a national level. These benefits which could be categorized as direct and indirect benefits are also evaluated regarding the accompanied costs.

6.1 Approach

The cost and benefit analysis will be conducted in two steps:

1. A detailed project investment cost assessment will be elaborated, while the forthcoming masterplan will provide all necessary input data for this analysis; and

2. A thorough assessment of all project benefits.

The analyses will be done separately for the different sections of the proposed MGLH. This segregation will closely follow the master planning and consider required major separate physical structures such as:

a) Container facility

b) Intermodal facility

c) Import container deconsolidation facility

d) Storage and bagging of imported fertilizers and grain (dry bulk)

e) Export c onsolidation, storage and containerising of coffee

f) Export consolidation, storage and containerising of sesame exports

g) Processing, cooling and containerising of horticultural export products in cool chain

h) Facilities for De-consolidation of imported containerizes cargoes

The analyses will be undertaken from the point of view of the national economy or the society. Thus with regard to any investment costs all indirect taxes (e.g. VAT), customs duties and subsidies, if any, will be deducted.

6.2 Benefits

Benefits will refer to the specific measures (investment) proposed by the forthcoming Masterplan and compare the expected positive impacts with the without case. The main benefits that will be analysed are mentioned in this section.

Part of these economic benefits are tangible, others are not. In some case even theoretical measurements is fraught with difficulty. I The consultants will quantify benefits (in physical terms) and endeavour to monetise them wherever possible.

The major direct benefits are:

1. Shifting storage in high valued seaport land area to dry port

The Port of Djibouti is generally lacking of space and each storage slot has a high value. Hence, storage cost are high and in the specific Ethiopia-Djibouti relationship these storage cost have to be paid in foreign currency. MGLH provides the opportunity to store the container cheaper in the inland money instead of expensive at the port.

2. Reduction of congestion in seaports

Congestions are a challenge for many international ports. With increasing vessels sizes and accompanied more peak situation for deliver export and dispatched import cargothe situation is becoming even more critical than better. Congestions are related to every transport mode. The function of MGLH is cover the container related services (e.g. customs clearance, etc.) and facilitate their performance in the hinterland, which again relieves seaport capacities.

3. Facilitation of efficient regulatory procedures

Often the mandatory regulatory procedures at Djibouti customs inspection and clearance, phytosanitary services, ISO inspections etc. are delayed due to lack of checking space, staff and congested infrastructure are quite time consuming. All stakeholders are benefitting from the provision of these services at a central location within MGLH really.

4. Consolidation of cargo to facilitate viable distribution solutions

MGLH consolidates cargoes in both directions – import and export. The real benefits are the economies of scale generated by the comparatively huge amount of cargo for which it is the origin or destination. The existing rail connection is underpinning this fact as a train travel replaces many truck journeys.

5. Increase of the reliability and security of transport chains

By establishing standard cargo handling procedures, including regular departures and safe storage of goods, MGLH facilitates the improvement of reliability and security remarkably. The utilization of rail transports really supports this approach as this transport mode is almost prevented from traffic jams as well as theft becoming more difficult.

The major indirect benefits are:

1. Supporting development at Modjo region

Being a destination and/or origin for many cargoes many truck drivers and workers are involved in the MGLH. This generates opportunities for further services and business staring with accommodation and restaurants and probably ending up in foreign investment for value added services in and around the MGLH.

2. Reduction of CO2 emissions

MGLH is currently the only hinterland hub which is that well connected to the railway network. By shifting more and more cargo from road to rail transport it contributes the reduction of CO2 emission as train operate much more environmental friendly as e.g. trucks.

The related costs will be in detail elaborated by the next report. The cost and benefit analysis will finalized within this report.

ANNEX 1: REGISTER OF EXISTING DOCUMENTS AVAILABLE

No.	Name	Author	File Name	Month/Year	Short Description / Content (Summary)	Number of Pages
Documents Received during the Tender Stage						
01	A Strategy and Transformation Study for ESLSE Final Report	MTBS	MTBS Study Final Report.pdf	06/2014	This involves the strategy and transformation study for the Ethiopian Shipping & Logistics Services Enterprise (ESLSE): o Applied Methodology o The Ambition of the Central Government o The future looks bright o ESLSE's ambition: to become of world class logistics service provider o Introduction of competition as underlying business principle for ESLSE's strategy o Logistics Strategy within the Corridor Companies o Shipping Strategy built around three pillars o Partnering Strategy required to become a world class logistic service provider o The Implementation Plan	691
02	National Freight Logistics Strategy for Ethiopia	Ethiopian Maritime Affairs Authority	NFLS Summary Sept 2016.pdf	08/2016	This involves the national freight logistics strategy for Ethiopia: o Overview of Ethiopia's Logistics Performance o Freight Logistics Strategies for Ethiopia's Development o Moving from Strategy to Implementation	61
03	Development of a National Logistics Strategy for Ethiopia TECHNICAL REPORT Volume 2: Diagnostic Analysis of the Current Logistics System	Nathan Associates Inc.	Revised Diagnostic Report Final.pdf	05/2014	This involves the development of a national logistics strategy for Ethiopia: o Trade Data and Development Strategy o International Trade Corridors o Export Value and Supply Chains o Import Value and Supply Chains o Transaction Analysis o Transport Network and Oper o Logistics Services ations o Regulatory Enforcement o Institutional and Legal Analysis o Summary and Conclusions	366

No.	Name	Author	File Name	Month/Year	Short Description / Content (Summary)	Number of Pages
Documents Received during the Inception Stage						
01	Ethiopia Trade Logistics Project – An Environmental and Social Impact Assessment (ESIA) of a Proposed Trade Logistics Hub at Modjo, Ethiopia	Ministry of Transport, Ethiopian Maritime Affairs Authority	ESIA Modjo_SFG2868-EA-P156590-Box402873B-PUBLIC-disclosed-1-17-17	12/2016	The report contents: ○ Administrative, Environmental Policy and Legal Framework Approach and Methodology ○ Existing Baseline Conditions ○ Public Consultation and Stakeholder participation ○ Land Acquisition and Compensation Process ○ Analysis of Alternatives ○ Impact Identification and Evaluation ○ Environmental and Social Management and monitoring Plan Website: http://documents.worldbank.org/curated/en/652921484729885671/pdf/SFG2868-EA-P156590-Box402873B-PUBLIC-disclosed-1-17-17.pdf	161
02	PDF Prints - Imported Container Report (2012-18)	Scan PDF Pages	Imported Container Report (2012-18).pdf	-/-	○ Imported Container Report from 2012 – 2018 for all Dry Ports from Djibouti ○ Oprerational Cost fo Fuel Jan 2015 – Dec 2017	4
03	PDF Prints - Future trends in logistics - MTBS study	Scan PDF Pages	Future trends in logistics.pdf	-/-	○ Table - Ethiopian trade volume Vs. GDP ○ Graphic - Ethiopian Trade forecast in tonnes, source MTBS ○ Table - GDP Base case- Forecast Trade, source: MTBS	2
04	PDF Prints - Cargo flow.pdf	Scan PDF Pages	Cargo flow.pdf	-/-	○ Cargo Flow	2

No.	Name	Author	File Name	Month/Year	Short Description / Content (Summary)	Number of Pages
05	National Logistics Strategy	UNDP in Ethiopia	Commissioned study National Logistics Strategy (W).pdf		Summary of Commissioned Study: o Situation analysis o Critical success factors o International trade corridors o Critical logistics factors identified from the supply chain analysis o Transactions o Banking sector and services o Road o Rail o Djibouti port o Ethiopian intermodal dry port in Djibouti (IMDP) o Corridor Performance o Air Cargo o Logistics services o Multimodal and unimodal o Dry port operations: Modjo and Kality o Regulatory enforcement o Transportation and transportation logistics policy o Legal framework o Conclusion	22
06	Ethiopia Trade Logistics Project Project Appraisal Document	IDA	PRO201704135006.pdf	03/2017	The Project Appraisal Document contents: o Strategic Context o Project Development Objectives o Project Description o Implementation o Key Risks o Appraisal Summary	120
07	Project: Modjo – Hawassa Highway Project (Phase I) Country: Ethiopia Project Appraisal Report	AfDB	Ethiopia_-_Modjo-Hawassa_Highway_Project__Phase_I__-_Appraisal_Report.pdf	10/2013	The Project Appraisal Document contents: o Strategic Thrust & Rationale o Project Description o Project Feasibility o Implementation o Legal Instruments And Authority o Recommendation	29

No.	Name	Author	File Name	Month/Year	Short Description / Content (Summary)	Number of Pages
08	ESLSE Financial data:	ESLSE	ESLSE Financial Data.pdf	2015-2017/2018	ESLSE Financial data with: o Revenue and Expense 2015 o Revenue and Expense 2016 o Revenue and Expense 2017 o Administrative and General Budget 2015/2016 o Administrative and General Budget 2016/2017 o Administrative and General Budget 2017/2018 o Administrative and General Budget 2018/2019 o Balance Sheet 2015 o Balance Sheet 2016 o Balance Sheet 2017	21
09	Development of a National Logistics Strategy for Ethiopia INCEPTION REPORT	Nathan Associates Inc.	Ethiopia NLS Inception Report.pdf	08/2013	This outlines the following sections: o Approach to the Project o Economic Development Plan and Trade Data o International Trade Corridors o Preliminary Value/Supply Chain Data o Preliminary Review of Institutions, Infrastructure and Operations o Work Plan Refinement	69
10	The Expansion and Upgrading of Modjo Dry Port into a Logistics Hub Pre-Feasibility Study	FLK Trading PLC, Customs, Tax, Management & Finance Consultant	Modjo Pre Feasibility study 2016-12-17.pdf	06/2016	This outlines the following sections: o General Background of Modjo Dry Port o Status quo Analysis and Gap Identification o Traffic Forecasts o Logistic Hub Development o Impacts of the project o Modjo Logistic Hub Ownership o Financial Feasibility o Economic Benefits o Project Implementation Schedule o Summery And Recommendations	81
11	Development of a National Logistics Strategy for Ethiopia TECHNICAL REPORT Volume 3: Blueprint Strategy Report	Nathan Associates Inc.	NATHAN Blueprint_report.docx	12/2013	This involves: o Growth and Transformation Plan o Ethiopia's Logistics Performance o International Corridor and Gateway Systems o Production Network o Distribution Networks o Logistics Services	125

No.	Name	Author	File Name	Month/Year	Short Description / Content (Summary)	Number of Pages
12	Development of a National Logistics Strategy for Ethiopia TECHNICAL REPORT Volume 4: Interventions Report	Nathan Associates Inc.	NATHAN Interventions Report.docx	11/2014	This involves: o International Trade Corridor and Gateway Systems o Production Network o Distribution Networks o Logistics Services o Logistics Performance Management	163
13	Other documents received on 8 November 2018 from ESLSE, currently still being reviewed!	diverse	diverse	diverse	Relating to the existing port facilities / infrastructures	
Documents Received during the Site Mission for Infrastructure & Civil Works						
14	Bill of quantities for dry port service enterprise concrete duct (2800 m) at MODJO	-	modified modjo dry port site el phase 2'.xls	2004	Priced bill of quantities for site works: o Electrical site work o Excavation & earth work o Concrete work o Masonry work o Metal work o Finishing	3
15	Priced Bill of Quantity for Ethiopian shipping and logistics service enterprise dry port/ terminal sector	Water works business unit	MOdjo Revised quantity.xlsx	2004	Priced bill of quantities for site works: o Water supply and firefighting system o Storm water drainage system o Waste water drainage system o 200 m^3 reinforced concrete ground reservoir o 100 m^3 elevated water reservoir o Pump house o Borehole drilling	23
16	Specifications for Modjo Dry Port - Borehole Drilling at Modjo	Water Work Business Unit	Mojo 3 WATER WELL.doc	2002	o Bill of Quantity for well drilling and construction o Water Well Construction Specification: o Drilling o Test pumping of the well o Finishing works o Documentation o Measurement and basics of payment	11

No.	Name	Author	File Name	Month/Year	Short Description / Content (Summary)	Number of Pages
17	Final Pavement Design Report of Modjo Dry Port Project (with concrete Block Pavement)	Construction Design Share Company	Pavement Design Report for Modjo Dry port project Final.doc	January 2010	Design reports including: ○ Site Investigations ○ Pavement design ○ Material specifications ○ Laboratory test result ○ Test Pit Log ○ Specifications required	19
18	Technical Report on Modjo RMG		RMG report.docx	Nov. 4, 2018	Discussion and observations on the RMG installed at Mojo	6
19	Layout for Lot 1	Construction design S. Co.	ALL SITE LAYOUT.dwg	February 2011	Layout drawing of the dry port	1
20	Layout for Lot 1	Construction design S. Co.	ROAD & TERMINAL.dwg	February 2011	Road and container terminals layout	1
21	Layout for Lot 1	Construction design S. Co.	WASTE WATER.dwg	February 2011	Waste water layout	1
22	Firefighting line drawings	-	Firehydrant Edited Coordinate.dwg		Firefighting line drawings	1
23	Water Supply line layout drawings	-	Water Supply edited Coordinate 2007.dwg		Water supply line layout drawings	1
24	Electrical master plan layout	-	ModJo DRY PORT PHASE 2 ELECTRIC WORKING DRAWING.dwg		○ Electrical master plan ○ Typical pavement section ○ Typical concrete cover ○ Steel manhole cover ○ Communication Antenna drawing	1

No.	Name	Author	File Name	Month/Year	Short Description / Content (Summary)	Number of Pages
25	Layout for lot 1 Floor plan, section and elevations	Construction design S. Co. Ethiopian shipping & logistic service enterprise	weigh bridge MODJO SITE LAYOUT.dwg	February 2011 January 2018	○ Site layout drawing ○ Weigh bridge drawing	1
26	Electrical Site plan Street lighting details	k2n architecture and engineering consultancy plc	EL-mojo site plan.dwg	March 2018 April 2018	○ Electrical site plan layout drawing ○ Street lighting details drawing	1
27	Water Supply plan Waste Water plan Main hole details Detail Legend, notes and abbreviations	k2n architecture and engineering consultancy plc	MODJO _SN_20170711.dwg	17 July 2017	○ Building A1 ○ Water pipes plan drawing ○ Waste water plan drawing ○ Buried foul water drainage pipe laying drawing ○ Buried water supply pipe laying drawing ○ Typical section of man hole for water supply, waste water and storm water drawings	2

No.	Name	Author	File Name	Month/Year	Short Description / Content (Summary)	Number of Pages
28	Ground floor plan First floor plan Second floor plan Third floor plan Fourth floor plan Fifth floor plan Roof floor plan Elevations Section	k2n architecture and engineering consultancy plc	Modjo G+5 Office Buil.dwg	November 2015	Drawings of the new administration building: ○ All floors plan drawings ○ Elevations plan drawing ○ Section plan drawings	3
29	Site plan with contour Site plan Site section Ground floor with coordinates	k2n architecture and engineering consultancy plc	mojo contour.dwg		○ Site plan drawings	3
30	Site electrical installation Site board details	Acute Engineering	mojo EL.dwg	September 2016	○ Electrical installation drawing ○ Board details drawing	2
31	Mojo dry port site layout	Semeneh mossu	mojo.dwg		○ Site plan drawing (container maintenance area, container washing area, work shop and spare store …) ○ Existing and proposed road drawing	2

No.	Name	Author	File Name	Month/Year	Short Description / Content (Summary)	Number of Pages
32	Site plan	Acute engineering	mojo1.dwg mojo2.dwg	June 2016	○ Site plan drawing (container maintenance area, container washing area, work shop and spare store …) ○ Existing and proposed road drawing	2

ANNEX 2: EQUATIONS

Container Facility: Example based on forecast for 2019

Ground slots:

Import full TEU x dwell time full import / days per year x peak factor / utilization / stacking height = ground slots

144,736 TEU x 60 days / 365 days x 1.2 / 75% / 4 = 9,121 ground slots

Space required:

Ground slots x ground space of 1 TEU x gross/net factor = required space

9,121 ground slots x 18.2 sqm[34] x 1.6[35] = 265,604 sqm

265,604 sqm (26.5 hectares) are required for storing the full import containers in 2019.

[34] 18.2 sqm is a little bit larger than a container, because the containers are stowed with a small distance to each other.

[35] 1.6 means that the reach stacker operations require 60% of the net storage space in addition for roads, truck lanes etc.,

Import Deconsolidation Facility: Example based on forecast for 2022

Net storage area:

Import volumes TEU x stripping percentage x tonnes per import container x dwell time of unstuffed cargo / days per year x peak factor / utilisation rate / tonnes per sqm storage = net storage area

193,835 TEU x 10 % x 15 t x 20 days / 365 days x 1.2 / 80 % / 0.8 t/sqm = 29,872 sqm

Space required:

Net storage area x gross/net factor = required space

29,872 sqm x 3[36] = 89,615 sqm

89,615 sqm (8.96 hectares) are required for import container deconsolidation in 2022.

[36] 3 means, that the stripping operation needs three times the area of a single container.

Grain Import Facility: Example based on forecast for 2022

Net storage volume:

Annual volumes tonnes / bulk density x dwell time / days per year x peak factor / utilisation rate = net storage volume

377,585 t / 0.660 t/cbm x 22 days / 365 days x 1.2 / 60 % = 78,370 cbm

Required silos:

Net storage volume / silo area[37] x silo height[38] = required silos

78,370 cbm / 314.16 sqm x 20 m = 12 silos

Space required:

Silo area x required silos x gross/net factor + area of bagging facility[39] + bag storage facility[40] = space required

314,16 sqm x 12 x 3.5[41] + 800 sqm + 7,916 sqm = 22,431 sqm

[37] Assumed silo width of 20m.

[38] Assumed silo height of 20m.

[39] Estimated area of a grain bagging facility.

[40] 10 % of the net storage volume are estimated for the grain bag storage facility.

[41] 3,5 means, that the area for silo access has to be 250% in addition.

22,431 sqm (2.24 hectares) are required for the grain import area in 2022. To provide a market requested buffer storage of 150,000 tonnes, 37,774 sqm (3.77 hectares) would be required.

Fertilizer Import Facility: Example based on forecast for 2022

Tonnes per linear meter stockpile:

Width of stockpile[42] x max. stockpile height[43] x bulk density = tonnes per linear meter stockpile

34.64 m x 10 m x 1.100 t / cbm = 190.53 t

Net storage area:

(Annual volumes tonnes x dwell time x peak / days per year / utilisation rate) / tonnes per linear meter stockpile x width of fertilizer stockpile = net storage area

(521,072 t x 22 days x 1.6 / 365 days / 60 %) / 190.53 t x 34.64 m = 15,228 sqm

Space required:

Net storage area x gross/net factor + area of bagging facility[44] + bag storage facility[45] = space required

15,228 sqm x 2.5 + 800 sqm + 16,750 sqm = 55,620 sqm

[42] Assuming an angle of response of 30° of fertilizer material

[43] Estimating a maximum stockpile height of 10m due to structural restrictions.

[44] Estimated area of a grain bagging facility.

[45] 10 % of the net storage volume are estimated for the grain bag storage facility.

55,620 sqm (5.56 hectares) are required for the fertilizer import area in 2022. To provide a market requested buffer storage of 150,000 tonnes, 81,187 sqm (8.19 hectares) would be required.

General Cargo Import Facility: Example based on forecast for 2022

Net storage area:

Annual volumes x dwell time / days per year / tonnes per sqm x peak factor / utilisation rate = net storage area

409,100 tonnes x 30 days / 365 days / 3 t / sqm x 1.2 / 80 % = 16,813 sqm

Space required:

Net storage area x gross/net factor = required space

16,813 sqm x 3[46] = 50,439 sqm

50,439 sqm (5.04 hectares) are required for general cargo import area in 2022.

[46] 3 means that the reach stacker/ fork-lift operations require 200% of the net storage space in addition for roads, truck lanes etc.

Vehicle Import Facility: Example based on forecast for 2022

Net storage area:

Annual volumes	x	dwell time	/	days per year	/	sqm per vehicle	x	peak factor	/	utilisation rate	=	net storage area
23,849 cars	x	30 days	/	365 days	/	12.5 sqm/ vehicle	x	1.2	/	80 %	=	36,754 sqm

Space required:

Net storage area	x	gross/net factor	=	required space
36,754 sqm	x	2[47]	=	73,508 sqm

73,508 sqm (7.35 hectares) are required for vehicles import area in 2022.

[47] 2 means that the vehicle parking operations require 100% of the net storage space in addition for roads, access etc.

Coffee Export Facility: Example based on forecast for 2022

Net storage area:

Annual volumes	x	dwell time	/	days per year	/	tonnes per sqm	x	peak factor	/	utilisation rate	=	net storage area
44,117 tonnes	x	7 days	/	365 days	/	0.8 t/sqm	x	1.2	/	80 %	=	454 sqm

Space required:

Net storage area	x	gross/net factor	=	required space
454 sqm	x	4[48]	=	1,816 sqm

1,816 sqm (0,18 hectares) are required for coffee export area in 2022.

[48] 4 means that the coffee stuffing operations require 300% of the net storage space in addition.

Oilseeds Export Facility: Example based on forecast for 2022

Net storage area:

Annual volumes	x	dwell time	/	days per year	/	tonnes per sqm	x	peak factor	/	utilisation rate	=	net storage area
37,861 tonnes	x	10 days	/	365 days	/	0.8 t/sqm	x	1.2	/	80 %	=	1,945 sqm

Space required:

Net storage area	x	gross/net factor	=	required space
1,945 sqm	x	3[49]	=	5,835 sqm

5,835 sqm (0,58 hectares) are required for oilseeds export area in 2022.

[49] 3 means that the oilseeds stuffing operations require 200% of the net storage space in addition.

Fruit Export Facility: Example based on forecast for 2022

Net storage area:

Annual volumes x dwell time / days per year / tonnes per sqm x peak factor / utilisation rate = net storage area

7,390 tonnes x 1 days / 365 days / 0.8 t/sqm x 1.2 / 70 % = 42 sqm

Space required:

Net storage area x gross/net factor = required space

42 sqm x 6[50] = 264 sqm

264 sqm (0,03 hectares) are required for fruit export area in 2022.

[50] 3 means that the fruit stuffing operations require 500% of the net storage space in addition.

Vegetables Export Facility: Example based on forecast for 2022

Net storage area:

Annual volumes x dwell time / days per year / tonnes per sqm x peak factor / utilisation rate = net storage area

70,272 tonnes x 2 days / 365 days / 0.8 t/sqm x 1.2 / 80 % = 722 sqm

Space required:

Net storage area x gross/net factor = required space

722 sqm x 4.5[51] = 3,249 sqm

3,249 sqm (0,33 hectares) are required for vegetables export area in 2022.

[51] 4.5 means that the vegetables stuffing operations require 350% of the net storage space in addition.

Customs Inspection Facility: Example based on forecast for 2020

Space inspection TEU import:

Annual import inspection containers[52] x peak factor / days per year / TEU per slot and day x space per TEU inspection[53] x gross/net factor = space inspection TEU import

159,653 TEU x 1.2 / 365 days / 2 TEU x 130 sqm x 2[54] = 20,471 sqm

Space inspection TEU export:

Annual export inspection containers[55] x peak factor / days per year / TEU per slot and day x space per TEU inspection[56] x gross/net factor = space inspection TEU import

784 TEU x 1.2 / 365 days / 2 TEU x 130 sqm x 2[57] = 201 sqm

[52] Assuming an inspection rate of 30% of the annual import containers.

[53] Assuming 130m² needed for a TEU inspection.

[54] 2 means that the reach stacker/fork lift and inspection operations require 100% of the net storage space in addition for roads, truck lanes, temporary storage area etc.

[55] Assuming an inspection rate of 30% of the annual import containers.

[56] Assuming 130m² needed for a TEU inspection.

20,672 sqm (2.07 hectares) are required for inspection of import and export containers in 2020.

[57] 2 means that the reach stacker/fork lift and inspection operations require 100% of the net storage space in addition for roads, truck lanes, temporary storage area etc.

ANNEX 3: EXPLANATION OF USED PARAMETERS FOR REQUIREMENTS CALCULATION

Term / Parameter	Explanation
access lane process duration	time needed to process paperwork of incoming container trucks. Information about cargo type, origin and destination of the particular container have to be submitted at an access counter of some sort.
admin (non productive time per train)	carried out due to positioning of the train or paperwork.
angle of repose	dry bulk materials are stored stockpiles either in warehouses or open storage areas. The angle of repose is the steepest angle of descent relative to the horizontal plane on which a material can be piled without slumping. At this angle, the material on the slope face is on the verge of sliding.
annual hours	amount of hours available for operations during one year. Dependent on the shift allocation the total operation hours time per day.
bulk density	density of the dry bulk material stored. Usually given in tonnes per square meter it is needed for the calculation of storage area for dry bulk materials like coal, gravel, fertilizer, grain, etc.
commodity	describes a certain kind of cargo, which needs individual handling.

Term / Parameter	Explanation
container per slot/day	amount of containers inspected on one single slot in the customs area. Has to be calculated for the estimation of custom area sizes and is defined by the duration of an inspection and the operating hours per day.
container stripping percentage	share of the total incoming/outgoing containers to be stripped for examination by customs. Value given in percentage of a total number of containers.
daily containers peak	maximum amount of containers at e.g. customs area at once per day. Defined by the daily amount of containers and the peak factor.
direct import container truck percentage	amount of incoming container trucks without examination by customs.
duration inspection	time needed for customs for moving a container to the customs facility, stripping the container, examine the cargo, check paperwork, re-stuff the container and move it back to the yard.
duration stuffing	time needed for the process of loading any type of cargo into the container and prepare it for transport.
dwell time	period of time the cargo (either import- or export cargo) stays within a terminal/facility/storage slot. It covers the time from entering the terminal/facility/storage until leaving the same. When e.g. a full container has been dispatched and returns empty to the same terminal new dwell time starts for the empty container when it enters the terminal.

Term / Parameter	Explanation
equipment availability	net time for a certain equipment type to be ready for operation considering maintenance, downtime and breakdown. The value is the average time of full functional operation for a specific equipment type.
gate lanes full required	number of lanes required for a fully functional entrance/exit gate considering all mentioned assumptions.
gross/net factor	provides best practice ratios of storage area in relation to total required area which then includes handling for forklifts, truck operations, container stripping, etc. Storage only would not reflect the actual requirements, as cargo would not be accessible for pick up and/or delivery.
handling duration per train	time needed for the process of loading and unloading of a cargo train considering the described boundary conditions.
inspection percentage	share of the total import/export containers to be inspected by customs.
max construction height	maximum construction height of storage facilities like warehouses, silos, etc.
maximum track occupancy	percentage of occupancy for a certain rail track. Parameter for the calculation of a realistic number of needed rail tracks. An occupancy of 100% will not be reached, because of e.g. train movements, maintenance works etc.

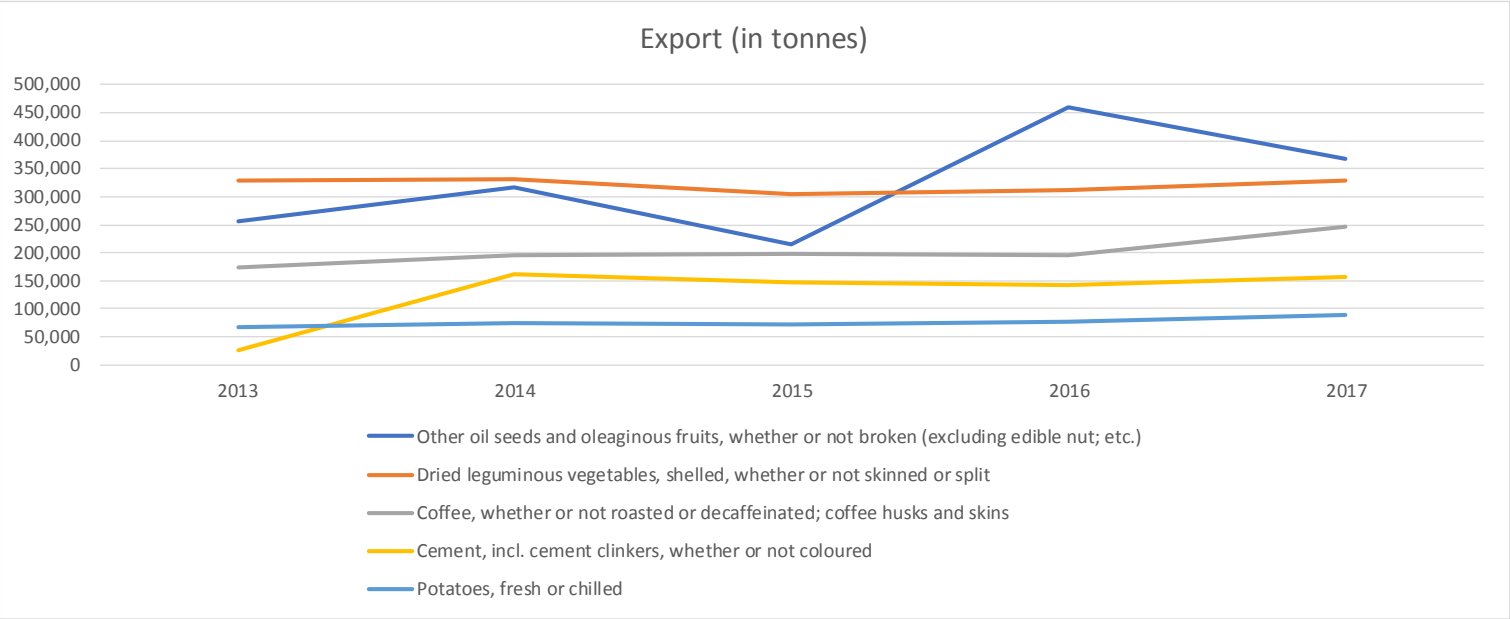
Term / Parameter	Explanation
moves/container	moves per container. Amount of moves by the certain container handling equipment (e.g. unloading by crane, stacking by stacker etc.) needed for the handling of one container sorted by equipment type.
net storage area	the net area needed for the storage of goods only, excluding handling area for forklifts, truck operations, etc. For a container it is the base container area, which is the footprint at the storage area of the cargo.
operating hours/day	maximum amount of hours a certain operation is possible to be done per day in regards to shift allocations and maximum working hours for staff.
paperwork duration	time needed to process paperwork of incoming trucks. Information about cargo type, origin and destination of the particular cargo have to be submitted at an access counter of some sort. Experience shows, that the documents check for containers is significantly quicker than for most other sorts of cargo.
peak factor	recurring „stress“ the facility is exposed to above the long time average. For the yard the peak is usually calculated based on seasonal and/or cargo arrival patterns and hence relatively low. For the gate, the peak is calculated based on recurring daily peaks, i.e. it is likely that cargo delivery/pick up falls into morning and/or afternoon hours with lower requirements in the other hours of the day. Calculating the peak is to ensure that the facility will be able to handle these higher requirements without negative impacts on the on-site performance and also the surrounding areas (traffic flow, etc.)

Term / Parameter	Explanation
reefer container	special container for the transport of perishable goods. There are two systems: "integral reefer" with an on-board cooling unit operated by electricity or by a diesel engine, "isolated reefer" which has to be connected to the refrigeration system of the vessel.
road share	amount of vehicles entering/leaving a terminal/warehouse/or similar by road, usually for one specific vehicle type (trucks, trains etc.). Value given either as total number of vehicles or as percentage of a total number of vehicles.
space per TEU stuffing	Space needed for the process of container loading and preparation for transport.
specific storage radius	assumption for a suitable silo, stockpile or similar radius for a particular case. The radius is used for the further calculation of the storage capacity.
sqm/car	square meter per car. Space needed at a storage area for the placement of one single car.
TEU factor	explains the composition of certain container volumes of 20' and 40' container sizes. The factor can be between 1 and 2, whereby a high value typifies a high amount of 40' containers .
tonnes/sqm	Tonnes per square meter. Weight of a certain good loading on one square meter. Value takes storage characteristics like dumping heights (dry bulk goods) into account.

Term / Parameter	Explanation
unit/truck	unit per truck. Gives information about the size/loading capacity of the used trucks. Typical units are TEU/containers/tonnes.
utilization	level to which the actual capacity may be used efficiently. The percentage incorporates the knowledge on efficiency in operation reducing shuffle and housekeeping ensuring service levels can be provided in line with customer expectations.
volume	typically given in cubic meters. Space needed to fit in a certain amount of a certain good. Used to standardize the weights of different goods with different density factors.

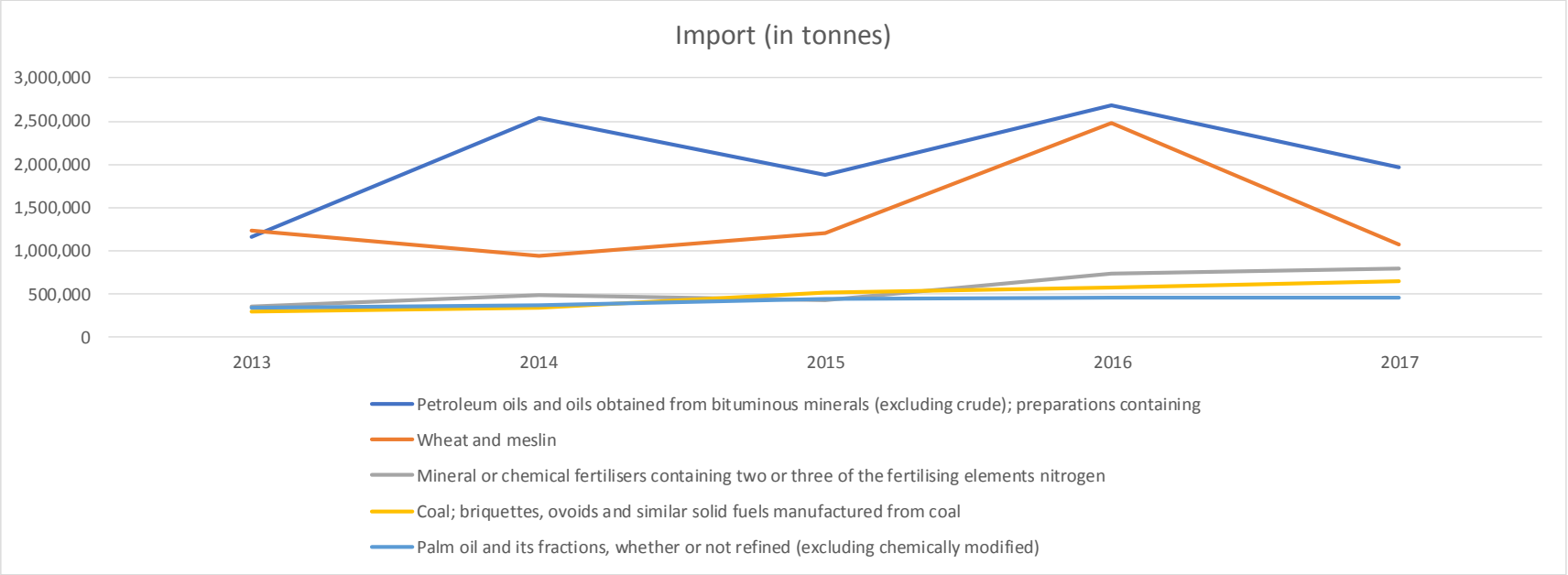
ANNEX 4: TABLES OF GRAPHS

Ethiopian Export in tonnes: 2013-2017



Products:	2013	2014	2015	2016	2017
Other oil seeds and oleaginous fruits, whether or not broken (excluding edible nut; etc.)	256,910	315,817	214,708	459,469	367,032
Dried leguminous vegetables, shelled, whether or not skinned or split	328,746	330,400	303,525	311,443	329,877
Coffee, whether or not roasted or decaffeinated; coffee husks and skins	173,070	196,280	198,404	195,431	247,264
Cement, incl. cement clinkers, whether or not coloured	26,237	161,390	147,511	141,802	157,518
Potatoes, fresh or chilled	65,951	73,293	71,439	75,919	89,193

Ethiopian Imports in tonnes: 2013-2017



Products:	**2013**	**2014**	**2015**	**2016**	**2017**
Petroleum oils and oils obtained from bituminous minerals (excluding crude); preparations containing	1,166,800	2,537,462	1,879,421	2,678,956	1,970,553
Wheat and meslin	1,234,586	937,573	1,199,891	2,475,980	1,076,876
Mineral or chemical fertilisers containing two or three of the fertilising elements nitrogen	353,808	495,045	430,605	739,322	796,908
Coal; briquettes, ovoids and similar solid fuels manufactured from coal	291,932	345,894	514,814	570,739	643,516
Palm oil and its fractions, whether or not refined (excluding chemically modified)	339,891	377,286	445,652	460,077	457,517