# Factors Affecting Inland Port and Terminal Operations Performances: The Case of Modjo Inland Ports of Ethiopian Shipping and Logistics Services Enterprise

**By: Wubeshet Demissie**

**Advisor: Dr Matiwos Ensermu**

**Presented In Partial Fulfillment of the Requirements of Master of Arts Degree in Logistics and Supply Chain Management**

**June, 2022**

**Addis Ababa, Ethiopia**

## Declaration

I, the undersigned, hereby declare that the work contained in this thesis is my own original work and that I have not previously in its entirety or in part submitted at any university for a degree.

Signature: _____ Date: _____

**Addis Ababa University**

**School of Commerce**

**Department of Logistics and Supply Chain Management**

This is to Certify that the thesis prepared by Wubeshet Demissie, entitled: Factors Affecting Inland Port and Terminal Operations Performances: The Case of Modjo Inland Ports of ESLSE. Submitted in partial fulfillment of the requirements for the Degree of Master of Arts in Logistics and Supply Chain Management complies with the rule and regulations of the University and meets the accepted standards with respect to originality and quality.

Signed by the Examining Committee:

Advisor: _____ Signature:_____Date: _____

Internal Examiner:_____ Signature:_____Date: _____

External Examiner: _____ Signature:_____Date: _____

_____

Chair of Department or Graduate Program Coordinator

## Acknowledgment

I never felt in my life like this, because am feeling like “Light in the dark”. So, first of all Thanks to Almighty God “Medehanelem” for guiding and carrying me day and night, in my ups and down, and within anger and happiness for five years of my education and entire life. With me there is the only one God is there so the one who belongs this paper God will be thanked forever first. Second, I want to thank myself for my every unstoppable effort and patience I had made and passed through to achieve my goal. Third, I want thank my family for their untold able support of everything. Finally, I would thank my advisor Dr. Matiwos for his academic supervision through the study.

# Table of Content

# List of Table

# List of Figure

# List of Abbreviation

| | |
|---|---|
| CFS: | Container Freight Station |
| CY: | Container Yard |
| EDI: | Electronic Data Interchange |
| EMAA: | Ethiopian Maritime Authority |
| ERCA: | Ethiopian Customs and Revenue Authority |
| ESL: | Ethiopian Shipping Line |
| ESLSE: | Ethiopian Shipping and Logistics Services Enterprises |
| ETLP: | Ethiopian Trade Logistics Project |
| GDP: | Gross Domestic Product |
| ICD: | Inland Container Depot |
| LLDCs: | Landlocked developing countries |
| MDP: | Modjo Dry Port |
| MTS: | Multimodal Transport System |
| MTO: | Multimodal Transport Operation |
| PCS: | Port Community System |
| SPSS: | Statistical Package for the Social Sciences |
| TEU: | Twenty foot Equivalent Unit |
| UNCTAD: | United Nation Conference on Trade and Development |
| UNESCAP: | United Nations Economic and Social Commission for Asia and Pacific |

# Abstract

This research evaluate the influencing factors of inland port and terminal operations performance and identifying major factors that contributed to operation underperformance of Modjo inland port operation performance. This research based on grounded theories on the past literature and employed descriptive and explanatory research design with both qualitative and quantitative approach. The 101 sample were collected using stratified and convenience sampling technique from four stratum based on their sample size through survey questioner of close and open ended question. Additionally, interview with 12 participants was conducted and quantitative data from reports collected and analyzed to validate results from primary data. The collected data was analyzed using SPSS version 26. And the study identified additional factors that is economic and political factor in addition to hinterland condition, services features, capacity, and information sharing and government policy influencing factors of dry port operation performance and recommend economic stabilization and political stability for overcoming problem of dry ports in our country in general and Modjo dry port and terminal operation performance in particular.



Key Concepts: Influencing factors of Dry ports, Modjo inland port and terminal, Operation performance.

# CHAPTER ONE

# INTRODUCTION

## 1.1 Background of the Study

Maritime transport is essential to the world's economy as more than 80% of world merchandise trade is carried by sea. Sea transport ranks as the most cost-effective and least environmentally damaging mode of transport to move large volumes of goods and raw materials between countries. Maritime transport requires efficient ports to handle imports and exports. Port efficiency therefore has a direct impact on the relative capacity of countries to participate in international trade (UNCTAD, 2020).

Logistic integration in the development of seaports has brought the perspective of seaport development far beyond its immediate perimeter further into its hinterland (Notteboom, 2009). This has been evident in the development of inland logistic centers such as dry ports, inland ports, distribution terminals, freight villages, inland freight terminals, and inland container depots. A dry port is 'an inland intermodal terminal directly connected to seaports with high capacity transport means, where customers can leave and pick up their standardized units as if directly to a seaport' (Roso et al. 2009).

According to (Roso 2008; Beresford et al. 2012) dry ports are categorized based on the distance from seaports (close, mid-range and distant dry ports) and their locations (seaport-based, city-based and border-based dry ports) inland. Dry ports' has four main functions that is transportation, logistic, value adding services and administration function. And Globally Dry ports play four major roles, as an extended gateway for container seaports (Roso& Lumsden 2009), an integrator for intermodal transport systems (Kapros 2003; UNESCAP 2009), a freight platform (Visser 2006) and promoting regional economy development (Garnwa et al. 2009).

The Challenges faced by dry ports vary among countries. In general, the main issues were related to transport infrastructure and operations (Roso et al. 2009), information sharing (Beresford et al. 2012), competition (Wang 2009; Feng et al. 2013) and location (Nguyen 2014; Visser et al.

2009; Rodrigue et al. 2010). In addition, expensive labor costs (Roso et al. 2009 ; Bergqvist et al. 2010), depending on manual procedures for cargo inspections (CDP 2013) and lack of involvement of public sectors (Rodrigue et al. 2006: Beresford et al. 2012)are some of the additional challenges faced by dry ports globally.

Landlocked countries face a cost and time penalty compared with their coastal neighboring countries (Arvis et al, 2012). Land lockedness refers to the geographical situation of a country without direct access to the sea. Ethiopia is one of LLDC in East Africa and face a cost and time penalty compared to coastal countries in trade logistics such as high transit transportation costs, limitation of technical and technological capacity, imported inflation, limited investable resources and low mobilization of domestic financial resources to finance the massive investment requirement for rapid growth. In order to ease some of the problems in the transit countries, started constructing dry ports in its hinterland along the transit corridors and implemented Multimodal Transport System.

Modjo dry port is one of the largest and busiest dry ports that developed to overcome the challenges related to logistics and developed to a hub level through transformation in the service delivery, scope and capacity which will serve as a benchmark for other cargo centers FDRE National Logistics Strategy (2019).

Approximately 90% of containers handled in dry ports are concentrated near Addis Ababa and MDP shares 78.8% of the total throughput of the dry ports. The containers delivered through the Modjo dry port from 2008 E.C up to 2011 E.C were 1,717,555 TEU and on average 44, 646 and 43211.2 TEU containers per month were transferred in the year 2010 and 2011 respectively Rediet (2019). According to Gena, Mulugeta and Umer (2020), MDP plays significant role for MTS through saving foreign currency by handling the imported goods on time, this reduce unnecessary fee, decrease congestion, delay and confiscation of freight at port, provide different services and equipments. Despite MDP having strengths such as location, and adequate transport connectivity through road and rail, there are challenges faced. The value added services of the port are not sufficient, the reach stackers operated in container yard is inadequate with productivity of 5,000 TEU per CY hectare per annum, the terminal infrastructure between the rail connection and the CY is not in good condition and the ground infrastructure is of poor quality (World Bank, 2017).

Additionally, the challenges in MDP are unfinished infrastructure; shortage of advanced equipments and machines; shortage of freight transport; absence of railway; shortage of skilled human resource; limited capacity of terminal station, monopoly power of government enterprise to provide the system and poor public private partnership to provide. And the service quality is low in terms of both perception and expectations Yodit (2016).

To improve inland trade logistics, the government of Ethiopia through ESLSE is developing a network of dry ports throughout the country since 2009 to meet demand for maritime or sea transport. Dry ports are important for LLDC to minimize transportation cost and competitive their export product throughout the world. The country develop the dry ports for adequate supply chain routine for end to end speedy trade facilitation, to increase the competitiveness of local products , and to increase economic development. Therefore, this study was evaluated the factors that affect the inland port and terminal operations performances in the last six years and identified the major factors that contributed to the underperformance of inland port operation by focusing on Modjo dry port.

## 1.2 Statement of the Problem

The development of a dry port concept in Ethiopia is to provide effective and efficient foreign trade cargo movement to and from the sea ports, to promote competitiveness of the Ethiopian international trade through reduced corridor costs and save foreign currency for country. Port efficiency has a direct impact on the relative capacity of countries to participate in international trade that determined by both the cost of transit and the service quality needs of customers. Operational efficiency ensures a quick turnaround time for vessels, improve cargo handling, and reduce costs and low cargo dwell time (UNCTAD, 2020). The operation performance of dry ports and terminals can significantly affect a country's trade competitiveness and Modjo dry port is the major and largest dry port that connected to Djibouti sea port through road and railway so its operational performance has great impact on trade competitiveness of Ethiopia. The World Bank (2017) reports states that "The main bottleneck on the logistics supply chain for containerized imports is currently the dry port at Modjo.

There are significant operational constraints at the Modjo dry port including:- insufficient cargo handling equipment, lack of facilities for stuffing of export containers and unstuffing of import

containers, lack of proper systems for the management of the facility, leading to delays in locating containers and necessitating increased moves of boxes; the port is operating without a proper TOS(Terminal Operating System) and gate system, increased congestion around the facility due to poor traffic flow patterns and lack of parking spaces for trucks; Poor port security as evidenced by the absence of CCTV; and lack of facilities and readiness to handle inbound and outbound railway traffic when commercial operations start in early 2017 World Bank (2017). Additionally World Bank (2017) stated under investment in facilities and equipment, poor operational procedures and control, and lack of Yard management systems are responsible for the excess time for truck turnarounds and for 35%-40% of the container dwell time. For bulk imports the key weakness is the lack of storage and handling facilities in Ethiopia."

Wubeshet (2018) the major factors that hinder operation of MT operations are foreign currency problem, lack of modern ICT and transportation infrastructure in size and number, lack of competent professionals in the organization, lack of good governance and absence of competition. In addition Sileshi (2020) Modjo port logistics performance highly affected by infrastructure and timeless due to problems such as low technological and ICT tools availability, high dwelling time, and trucks stay time at the dry port. The human capital of the dry port is at poor level Rediet (2019). And the service quality is low in terms of both perception and expectations Yodit (2016). According to Gena, Mulugeta and Umer (2020) factors that affect operation of MTS in MDP is unfinished infrastructure; shortage of advanced equipments and machines, shortage of freight transport, shortage of skilled human resource, limited capacity of terminal station, monopoly power of government enterprise, lack of coordination between public and private. The dwell time at the terminal is currently between 50 and 60 days on average Munters (2019). Container dwell time is one of the many performance indicators to assess the efficiency of terminal operation (UNCTAD, 2020).

The MDP operational problems are utilization of resources, absence of control, procedures while delivering services, strongly customer complain poor ICT infrastructure and communication system. Thus the port services are unable to meet performance criteria of the prompt delivery and reliable services ESLSE report (2018). The poor performance of port management and operations, together with other procedural inefficiencies along the logistics chain, and

imbalanced freight rates that shipping lines charge because of empty backhaul cargo, are all contributing factors to high transport costs (Bofinger et al., 2015).

Research such as Jarzemskis and Vailiauskas (2007); Padilha and Ng (2012) and Ng et al. (2013) indicates that the location of a dry port, its transport connectivity, the freight market supporting its operations, and its relationship with seaports are the main determinants for functional dry port operations. Research such as that conducted by Roso and Lumsden (2009; 2010), and Ng and Cetin (2012) indicated that the provision of services provided by dry ports including customs clearance, container storage, maintenance and transfer between modes, and value-adding activities, influence their attractiveness to users. Government policies on transport infrastructure development and management are relevant to dry port operations. These policies include infrastructure investment (Shirley & Winston 2004), cabotage (Garnwa et al. 2009), multimodal transport (Horst et al. 2011) and seaport and transport infrastructure (Mak& Tai, 2010). Facilities, transport infrastructure and space are major factors determining dry port capacity and affect their operations (Jarzemskis&Vailiauskas2007;Black et al. 2013). These elements allow dry ports to perform logistic, transport, administrative and value adding functions for their clients and help them support seaports in coping with the dynamic environment that they are in. Dry ports need to be able to possess sufficient and accurate information from other players within the container freight system for moving container freight efficiently and effectively. Therefore, dry ports involved in information collaboration and coordination with other actors in the container seaport system are necessary. Information collaboration and coordination with relevant stakeholders help dry ports especially in risk sharing, asset utilisation, accurate forecasting and decision making both vertically and horizontally (Christiaanse& Kumar 2000).

Operations at the dry port are the largest bottleneck of the corridor and improving those will affect the total efficiency of the supply chain. Expansion of the dry port is required to handle future demand. With abundant of literatures and theories, the main factors that affect the dry port operations are hinterland condition, Services features, Government policy, Capacity and Information sharing. The reviews of literature show that most of study made on the implementation of multimodal transport system in Ethiopia related to assessment, contribution, challenges and others on the performance of multimodal transport service in ESLSE in relation to time, cost effectiveness and reliability. This requires further research on how to improve

Multimodal transport operations in Ethiopia by identifying factors that contributed to underperformance of inland port and terminal operations. For the last decade, the importance of dry ports has attracted worldwide academic research on dry port development. But, there has been very limited research undertaken on the Ethiopian context. Therefore, this research evaluated the factors that affect inland port and terminal operations performance in the case of Modjo dry port. And identified influencing factors of dry port and terminal operations and how this influencing factors impacted the operation performance of inland dry port.

## 1.3 Basic Research Questions

Based on the research problem this research aimed to answer the following research questions.

- What are the major factors that affect Modjo inland port and terminal operations performance?
- How these factors contribute to the underperformance of Modjo inland port?

## 1.4 Objective of the Study

The general objective of this research was to evaluate the factors that affect inland port and terminal operations performance by identifying the major factors that contribute to underperformance of Modjo inland port and terminal operation performance. Therefore, to attain the general objective of the study this research developed the following specific objectives. The specific objectives of the study are:

- To evaluate factors that affect inland port and terminals operation.
- To identify factors that affect Modjo dry port and terminal operation performance. And analyze how they contributed to operation underperformance.

## 1.5 Significance of the Study

The growth of transport networks along with dry ports contributes to the reduction in transportation cost as well as transit time, which attract more investment to logistics, manufacturing and service industries in the surrounding areas of dry ports. Dry ports play a great role as an extended gateway for seaports, an integrator for intermodal transportation, a freight platform, and the promoting of the regional economy due to its transport, logistic, value adding and administration functions. Dry ports are an integral part of logistic centers and an element of

the local, national and international transportation systems. Modjo dry port is one of the large and the major trade logistics chain of the country that currently serving our country as a logistics hub model to the remaining other seven dry ports and backbone of our international trade. So identifying and evaluating the factors that influence its operation is very important to optimize the benefits of Dry port. Therefore the outcome of this study has the following benefit: Primarily will benefit ESLSE and Modjo dry port managerial by providing important information on factors that affect inland port and terminal operation performance for improving practice, understanding it's status for future development of another dry port and other different directions. Second, this thesis will benefit the academic by contributing to the existing literature of dry port research through an empirical study on Modjo dry ports, which has not been seen in the academic literature. Third, the policy makers, academicians, researchers, and potential service users who directly or indirectly involve in the operation of dry port and terminal as service provider or customers will be benefited from this study if they make use of the outcome. Finally this study provide knowledge about the factors that affect inland port and terminal operations so it helps as an input for future researchers of in logistics and supply chain management field of study and expands knowledge about inland port and terminal.

## 1.6 Scope of the Study

This study is delimited to the factors that affect inland port and terminal operations performance of MDP and terminal. The study area focuses on the factors that contribute to underperformance of Modjo inland port and terminal operation. Because MDP are dry ports that have higher container throughput and it's the largest dry port than the other dry ports in terms services and number of customers. Another point of interest for the focus on these is due to country's importers and exporters are concentrated around the location of MDP and currently serving around two third of whole containerized cargo and bulk cargo of the country. And it is the hub port or logistic center connected to railway infrastructure besides road transports.

## 1.7 Limitation of the Study

This study focus on evaluation and identification of the factors that affect operation performance of inland port and terminal in the case of ESLSE by selecting or delimiting its scope to Modjo inland port from the eight inland dry port of ESLSE. So it is acknowledged that this study has some limitations and there is enough room for further study. The major limitations of this study

are as follows: Firstly, these studies only focus on factors that affect the operation performance of Modjo port and terminal hence; the results from this study cannot be generalized to overall inland ports of ESLSE. Secondly, the study is based on available information from secondary sources and primary sources. Accuracy of the study depends on provided information but adequate attention is given to reliability and validity of the research by persuading respondents about the importance of their response on the validity of this work and through crosschecking different literatures together with random observations and my experience of more than six years in Kality dry port. Finally, collecting well organized data from all supply chain participants or stake holders is difficult due to lack of time and finance so this study will have limitation of data.

## 1.8 Definition of Terms

Dry port: A dry port is an inland intermodal terminal directly connected to a seaport, with high capacity traffic modes, preferably rail, where customers can leave and/or collect their goods in intermodal loading units, as if directly to the seaport. Roso and Lumsden (2009)

Inland container depot: A common user facility with public authority status, other than a port or an airport, approved by a competent body, equipped with fixed installations and offering services for handling and temporary storage of any kind of goods (including containers) carried under customs transit by any applicable mode of transport, placed under customs control and with customs and other agencies competent to clear goods for home use, warehousing, temporary admission, re-export, temporary storage for onward transit and outright export (UNECE ,1998).

Container freight station: A warehouse or transit shed adjacent to the container yard used for stuffing and stripping of container cargo.

Cargo Throughput: Is the total volume of cargo discharged and loaded at the port. It includes break bulk, liquid bulk, dry bulk, containerized cargo, transit cargo, and transshipment.

Dwell time: Time spent by the container in the seaport or dry port.

Container Terminal: A port facility designated to provide an integrated use of berthing facilities for container ship and harbor transport system for containerized and their content.

Logistics Operation: Is a management of material flow and distribution of products to customers.

Performance: the act of performing a task, an action, etc

## 1.9 Organization of the Study

The research is divided into five chapters. The first chapter contains introduction of the study, which consists of background of the study, background of the organization, problem statement, and objective of the study, research question, and significance of the study, scope, limitations, and definition of terms and organization of the study. The second chapter deals with the theoretical and empirical literatures of the study of different authors about the inland dry port concepts, factors that affect inland port and terminal operations. The third chapter deals with the research methodology to be used in the study together with ethical consideration. In the fourth chapter, the researcher tries to present result and data analysis and interpretation concerning the factors that affect inland port and terminal operation in the case of Modjo inland port and terminal operations. The final chapter would have concentrate on summary, conclusion and recommendation on the overall study based on the analysis of collected data.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1. Theoretical Literature Review

### 2.1.1 Definitions and type of dry port

Dry port is "an inland location as a logistics centre connected to one or more modes of transport for the handling, storage and regulatory inspection of goods moving in international trade and the execution of applicable customs control and formalities". This definition contains the following three important notions. A dry port is: (a) a site where different transport modes may converge; (b) a location at which goods in transit to their final destinations are subject to a number of operations; and (c) a place where customs control and formalities are completed.

The different terms are used depending on the services offered and the role of the inland terminals (Anderson &Roso 2016). The entity described as a dry port also varies worldwide in scale, complexity and area of specialization (Roso& Lumsden 2010). For example, in terms of country, the term inland ports is used in America (Rodrigue 2011), forward ports in Africa (Ahamed 2010), and inland container depots in India (UNESCAP, 2006). In terms of the functions and facilities, and the role of the inland terminal, inland container depots (ICD), container freight stations (CFS), inland container yards and a freight village are used. A terminal is a specialized part of the port that handles a particular type of goods, e.g. cars, containers, wood, people, etc. Therefore, dry ports can be more effective intermodal terminals which highly replicate the function of seaports but in various inland locations. Roso et al. (2009) have provided a comprehensive definition of dry ports, that is: 'an inland intermodal terminal directly connected to seaports with high capacity transport means, where customers can leave and pick up their standardized units as if directly to seaport's. This definition was used for dry port throughout this thesis.

Dry ports are categorised based on the distance from seaports and their locations inland (Roso, 2008:Beresford et al. (2012 ). Close, mid-range and distant are three types of dry port classified by their distance from seaports. Close dry ports are located less than 50 km from seaports, relatively near seaports. Mid-range dry ports are located approximately 50 to 150 km from

seaports and are generally covered by road transport and distant dry ports are located more than 150 km from seaports and close to the hinterland or borders. The below Table 2.1 presented characteristics distant dry ports.

Table 2.1 Characteristics of distance based dry ports

| Specification: | Close Dry Ports | Mid-range Dry Ports | Distant Dry Ports |
|---|---|---|---|
| Activities | Transit | Rail link between seaport and market | Rail link between seaport and market |
| Location | Decongestion of city access | Region attracts industries | Acquiring new hinterland of the seaport |
| | Reduction of pollution | Increased intermodal transportation | Increased intermodal transportation |
| | Increased intermodal transportation | | |
| Infrastructure | Reduction of road maintenance costs | Reduction of road maintenance costs | Reduction of road maintenance costs |
| | Rail infrastructure development | Rail infrastructure development | Rail infrastructure development |
| Transport | Activity reduction from /to seaports | Coordination with rail traffic | Decrease of transport costs |
| | Reduction of waiting time for transport operators | Reduction of waiting time for transport operators | Coordination with rail traffic |
| Logistic | Increased inland access and city distribution | Increased inland access | Increased inland access |
| | Intermodality | Decrease of costs | Cost reduction |

Source: Adapted from FDT (2007)

Close dry ports mostly transported by road are specially designed to mitigate space and capacity constraints faced by seaports, overcome local traffic problems and consolidate road transport to and from seaports for clients outside the city area (Roso et al. 2009). Mid-range dry ports generally covered by road transport and serve as a consolidation centre for the seaport and acts as a buffer relieving zone to the seaport. Midrange dry ports are normally located near to the industrial area and increase the intermodal transportation between the industry zone and the seaport. Distant dry ports are located close to the hinterland or borders the transport distance between the seaports and dry ports is much larger, and inland shipping and rail become more competitive on these longer transportation distances. Being located far away from the seaport is not a serious issue for this type of dry port as long it alleviates road congestion, increases inland

accessibility, strengthens multimodal solutions, avoids traffic bottlenecks, reduces pollution and fulfils the needs of all stakeholders.

On the other hand Beresford et al. (2012) categorised dry ports based on their location, as seaport- based, city-based, and border-based dry ports. Firstly, seaport-based dry ports are located near to the seaport and aim to capture a high volume of containers and to relieve seaport capacity constraints. In general, a seaport relies on this type of dry port especially for fast customs clearance and space with low level of value adding services because it focuses on container clearance and consolidation.. Secondly, city-based dry ports are located within a larger logistic cluster which this terminal serves in terms of production and consumption. In contrast to a seaport-based dry port, this type of dry port focuses on a wider range of value adding services (Beresford et al. 2012). City-based dry ports are normally situated in logistic parks, manufacturing zones or production areas. For this reason, high accessibility, transportation facilities and a location near to city gateways are required. Moreover, they have sufficient land for future expansion and large facilities with various functions; and they tend to be located in metropolitan areas and mainly serve manufacturers and distributors (Beresford et al. 2012). Thirdly, border-based dry ports are located at border areas of a nation. The functions of this type of dry port are being a transshipment centre and providing customs clearance service to the stakeholders (Beresford et al. 2012). A border-based dry port performs as a connecting centre for inland freight distribution with different hinterlands, and is generally located in the border areas of particular countries that are a long distance from seaports. Therefore, border-based dry ports mainly serve domestic trade by road and rail to boost cross border trade development and they smoothen the supply chain system in landlocked countries (Beresford et al. 2012). The main responsibilities of border-based dry ports are enhancing domestic trade and international distribution, providing value adding services, space for containers, and supplying logistic services to stakeholders (Zou 2009).

Table 2.2: Characteristics of location-based dry ports

| Specification | Seaport-based dry port | City-based dry port | Border-based dry port |
|---|---|---|---|
| Activities | Customs clearance and consolidation capacity | Regional production area | Cross border and domestic trade |
| | Extended gateway | Inland gateway | |
| Location | Near to seaport | Urban area | Border area and away from seaport |
| Infrastructure | Cargo loading and discharging | Large facilities with diverse function | Transshipment centre |
| | Express customs clearance | Require sufficient land for expansion | Customs clearance |
| | Low range of value adding services | High range of value adding services | |
| Transport | Starting point for modal shifting | Long distance from seaport requires high access to transport network | Mainly serves domestic and international trade by road and rail |
| Logistic | Targeting of distributors operating on a JIT basis | Target both manufacturer and distributors with medium order lead time | Serves by road and rail to link inland freight distribution system in different hinterland |

Source: Adapted from Beresford et al. (2012)

### 2.1.2 Role of dry ports

The role of dry ports is considered by the part it plays in the container seaport system. The role of dry ports operation will be as follows:

An extended gateway for container seaports

The role of dry ports as an extended gateway of container seaports refers to seaport functions, such as container storage, consolidation, customs clearance and logistic services including value adding services which are undertaken by dry ports because they have more space available to them than congested seaports (Veenstra et al. 2012a). Dry ports assist seaports in responding to some of the issues in container terminals, such as changes in trade patterns that take advantage of changing freight and logistics processes, and they promote intermodal transfer close to the production market (Weisbrod et al. 2002).

An integrator of intermodal transport systems

Dry ports are normally considered for development at a location with various transport links such as highways, railways and inland waterways. Therefore, dry ports function as an integrator of various modes of transportation by encouraging intermodal transport operations (UNESCAP 2009). The combination of two or several transportation modes via dry ports lowers both costs and transit time for containers and improves the quality of the transport service (Bichou 2009).

A freight platform

The presence of dry ports reduces transport processes within cities and urban areas (Regan &Golob 2005). Moreover, the role of dry ports as freight platforms reduces container traffic in the city which in turn minimizes the consumption of urban space for transport infrastructure and contributes to general improvement of the urban environment.

Promoting the regional economy

The development of dry ports encourages trade and contributes to the growth of the regional and national economy. Well-positioned dry ports are able to attract industries to their surrounding area and utilize available land, labor and facilities, which expand a seaport's hinterland and promote regional economy for a nation (Garnwa et al. 2009). It is evident that in some less-developed countries, the development of dry ports is beneficial to the regional economy by offering jobs, investments, and development in transport infrastructure (Rodrigue &Notteboom 2009). The development in the multimodal transportation facilities nearby dry ports allows seaports, freight forwarders, shippers and other stakeholders to promote imports and exports of a region. New market development becomes possible as both imports and exports become cheaper, more reliable and efficient through the support of dry ports (Rodrigue&Notteboom 2009).

#### *2.1.2.1 The function of dry ports operation*

Dry ports provide a range of services such as container handling and storage, container stripping and stuffing, break bulk cargo handling and storage, bulk cargo handling and storage, customs inspection and clearance, container light repairs, freight forwarding and cargo consolidation services, inventory management and materials handling, and banking/insurance/financial

services. Based on these services, the function of dry ports can be categorized into four main functions including transport, logistic, value adding and administration.

The transport function requires the dry port to function as a transfer unit from one mode of transportation to another (Bergqvist 2016). The logistic function of dry ports reflects their capability to replicate seaports in order to perform as an extension of them (Roso&Lumsden 2010). The ability of dry ports to perform a value adding function means their ability to add value to cargo in the containers during operations and via customized services (Bergqvist 2016). Being an extended gateway to the seaport, the dry port must play an administrative function for seaports and their clients. Customs clearance is the main component in this function (Beresford et al. 2012). A dry port performing all of these functions enriches the trust and confidence of stakeholders to use this logistic centre for their business purposes (Woxenius et al. 2004) and strengthens the dry port's position in the container seaport system.

### 2.1.3. The Factors Influence the Development of Dry Port and its operation

#### *2.1.3.1 The hinterland condition*

As the gateway within the shipping chain, the ports are reflected by the changing circumstances of the hinterland. And the port function is normally be related to the development of the inland area. The growth of economic drives the demand of the port development. The relationship between the port and the hinterland is always close (Hoyle and Charlie, 1995). The area of the hinterland is affected by the nature, society and economic factors. The scale of the regional economy, the vigor of the economy development and the area of the hinterland decide the development of the port. The regional economics plays an important role in the development of the port. Research such as Jarzemskis and Vailiauskas (2007); Padilha and Ng (2012) and Ng et al. (2013) indicates that the location of a dry port, its transport connectivity, the freight market supporting its operations, and its relationship with seaports are the main determinants for functional dry port operations. These determinants are categorized as hinterland condition factors.

Location of the dry port:- The location of dry ports in relation to seaports and industrial zones affects how they can support the capacity of seaports in accommodating container traffic and helping regional economic development are the major factors affecting the determination of dry

ports. These shippers to reduce their transportation costs (Jarzemskis&Vailiauskas 2007; Bergqvist et al. 2010). The costs of development and economic stimulus for two elements provide a high potential for industrial development and generate a demand for dry ports (Bergqvist et al. 2010; Hanaoka and Regmi 2011; Chang et al. 2015). In Sweden, dry ports are located adjacent to industrial development zones to assist the shipper in maximizing their profits by reducing the cost of transportation from the hinterland to seaports (Bergqvist et al. 2010). On the other hand, a well-positioned dry port directly connected to a seaport attracts service providers and manufacturers to their surrounding area and supports the seaport in expanding its hinterland markets.

Transportation connectivity:- As an important node in the transport network, dry ports must possess a high frequency of transport services (Roso 2008) and a high quality of transport infrastructure such as rail, road or inland waterways (Horst &Langen 2008) for container distribution to and from the seaport. Transport efficiency and a high capacity of transport modes increase the speed of movement of containers without excessive dwelling times, which subsequently minimizes overall transport costs (Ahamed 2010). The ability of a dry port to provide sufficient transport services due to the adequate transport connectivity prevents clients from outsourcing to external logistic providers (Bergqvist et al. 2010).

An outcome from research on networking development between logistic centres, seaports and other logistic operators by The Association of Danish Transport Centres (FDT) indicated that for effective dry port operations, regularity, frequency, dependability, flexibility and availability of transport connections between seaports and dry ports are critical from the carriers' perspective (FDT 2007). According to Hanaoka and Regmi (2011), the combination of road and rail transportation to and from seaports via dry ports for container collection and distribution increases the traffic of containers being handled in Indian inland container depots (ICD). and dry ports is important for the two transport nodes to work efficiently in a freight system (Rosa &Roscelli 2009), in reality competition exists between seaports and dry ports, limiting the performance of dry ports. Particularly when a seaport shows a high interest in dominating its hinterland markets, it triggers competition with dry ports. This has been evident in dry ports in Brazil (Ng et al. 2013). Competition in similar functions between seaports and dry ports affects the performance of dry ports. For example, seaports intend to gain benefits from dwelling time

by delaying the container transfer from seaports to dry ports. As a result, the dry port operator is unable to operate at a competitive advantage level and can fail to deliver containers to the shipper at the promised time (Ng et al. 2013). This implies that a collaborative relationship between dry ports and seaports should be formed to enhance dry ports in managing container freights smoothly, which will in turn benefit customers.

#### *2.1.3.2 Services features*

International trade is increasing significantly with the expanding global economic integration. And the cost of the sea transportation is always much cheaper than the land or air transportation. About 90% of the international trade goods are delivered by shipment due to the low transportation cost. The lower transport cost can reduce the final price for the trade product and lead to the growing trade volume. And the bigger trade volume can decrease the price of the transportation unit through economies of scale and specialization of the shipping operation. Not only has the volume of the cargo, but also the distance between the place of departure and the destination affected the transport demand. Research such as that conducted by Roso and Lumsden (2009; 2010), and Ng and Cetin (2012) indicated that the provision of services provided by dry ports including customs clearance, container storage, maintenance and transfer between modes, and value-adding activities, influence their attractiveness to users. The following section explains how each service feature component can influence dry port operations.

Customs clearances:- The implementation of customs clearance beyond seaport territory reduces container waiting times and congestion in the seaport area (Panayides& Song 2009). Customs clearance procedures in dry ports makes the containers available for direct shipment (export) and also direct distribution to the dry port after shipment(import). This procedure reduces container transit times in the seaport which significantly reduces congestion, cost, and provides a time advantage to the clients as well (Roso& Lumsden 2010).

Container storage, maintenance and transfer:- Warehouses, container maintenance workshops and depots for empty containers are prerequisites for dry port operations (Roso& Lumsden 2010; Ng & Cetin 2012). The availability of a full range of services in a dry port promotes the dry port concept of 'Through-Transport,' that is, of dry ports as common user facilities supporting transfer of containers from the seaport of origin to the seaport of destination (Beresford & Dubey 1990). In Tanzania, the Isaka Dry Port provides a cross border transportation service and

documentation clearance for landlocked countries, which decreases their transportation costs, enhances the speed of container delivery and reduces congestion and delays in the Dar er Salaam seaport (Arvis et al. 2010).

Value adding services:- In addition to offering services such as loading/unloading, storage, maintenance, transfer, administration, customs and warehousing, dry ports are expected to provide a range of value-adding services, for example sorting, mixing, blending, making, bar coding, packing, and labeling. These services develop an advantage to attract customers, and compete with seaports and other types of inland terminals (Robles 2013). Providing a range of value adding services on time with reliable quality increases dry port attractiveness. Moreover, it can potentially increase a dry port's cargo handling volume, enhance customer satisfaction, and establish a good relationship with the players in the transport chain (Andersson &Roso 2016). Incompetence in providing a range of value adding services is the main reason for the closure of Piracicaba Dry Port in Brazil (Padilha& Ng 2012).

#### *2.1.3.3 The government policies*

The attitude of the government is also important for the development of the shipping industry. The restrictive policy can decrease the throughput of the port, while the introduction of the policies to encourage can help the shipping industry to develop. (Lee, 1990) The port is one of the basements of the national economics, so both the national government and the local government are taking it seriously. Government policies on transport infrastructure development and management are relevant to dry port operations. These policies include infrastructure, investment (Shirley & Winston 2004), cabotage (Garnwa et al. 2009), multimodal transport (Horst et al. 2011) and seaport and transport infrastructure (Mak& Tai, 2010). How each policy affects dry port operations is discussed in the following section.

Investment policy:- Investment policy which allows an agglomeration between private and public partnerships (PPP) in dry port operations has been widely adopted, involving the private sector in financing dry port development, while the public sector provides land for development and plays a regulatory role in their operations (Rodrigue et al. 2006). Therefore, PPP is the combination of both sectors, and increases efficiency by providing legal, technical and financial competence between both parties to manage and operate dry ports (Rodrigue et al. 2006; FDT 2007). This policy also increases transparency, and information sharing, it tightens security in

dry ports and strengthens experience and knowledge for the smooth operation of the dry ports (FDT 2007).

Cabotage policy:- Cabotage policy is the trade between respective seaports within a region by vessels registered in their countries, known as national flag vessels. This policy is important for encouraging costal shipping by enhancing the population of local registered vessels and increasing the incorporation of local companies in domestic shipping (Suffian et al. 2013). As a result, dry ports may benefit from the increase in coastal shipping activities. Development in short sea shipping through cabotage policy develops high collaboration in intermodal operations. Cabotage policy integrates the trucking and rail industries effectively and efficiently (Brooks et al. 2014). Therefore, seeking inland distribution to reduce the transport costs of reaching final destinations becomes the ultimate target of this policy.

Multimodal transport policy:- Dry ports perform the role of integrating different modes of transport; therefore a multimodal transport policy which affects modal split is important for dry port operations. By utilizing rail transport, for example, traffic congestion is alleviated, emissions are lowered, and distribution costs and time are reduced (Mussone et al. 2015). In South Africa, an imbalanced proportion of rail and road transportation modes (30:70) caused delays, congestion and difficulties in predicting vessel turnaround times (Curtis 2009). Thus, policy makers had to pay a great deal of attention to initiating, promoting and implementing a multimodal transport policy which focused on transport links and transport nodes for the efficient delivery of containers from origin to destination (Hanaoka &Regmi 2011).

Sea port policy:- Seaport policy which aims at utilizing and improving landside transportation and establishing inland networks impacts on dry port operations. This kind of policy has been developed parallel to the seaport industry especially in terminal specialization and the demand for effective inland transportation systems (Mak& Tai 2010). The implementations of seaport policy in Thailand, Myanmar and Vietnam have generated additional investment into the development of transportation links connecting these seaports, dry ports and their respective hinterlands. This approach has improved intermodal infrastructure and seaport-hinterland connectivity (Sukdanot 2013; Black et al. 2013; Nguyen 2014).

Transport infrastructure policy:- Transport infrastructure policy provides capacity and durability in the form of highways, railway gauges, traffic lanes and thick pavements for heavy motor vehicles to achieve effective distribution processes (Shirley & Winston 2004). The development of transportation infrastructure attracts investments in that particular location. By the emergence of new manufacturers, dry ports secure freight to and from seaports. Mandalay dry port in Myanmar, the government has reduced land costs and tax rates to encourage the development of new industries near Mandalay dry port. This support from the government has attracted new industries to operate adjacent to the dry port, creating new job opportunities and boosting regional development in Myanmar (Doust & Black 2009). This kind of government influence can determine dry port performance and also can boost regional development (Ng & Gujar 2009). Consequently, the implementation of centralized integrated planning, clarity in regulations for initiating infrastructure investment and developing new legislation to encourage collaboration between seaports and dry ports can generate effective use of inland logistic infrastructure for economic and environmental benefits (Garnwa et al. 2009; Ng & Gujar 2009; Ng & Cetin 2012).

#### *2.1.3.4 Capacity*

Facilities, transport infrastructure and space are major factors determining dry port capacity and affect their operations (Jarzemskis&Vailiauskas2007;Black et al. 2013). These elements allow dry ports to perform logistic, transport, administrative and value adding functions for their clients and help them support seaports in coping with the dynamic environment that they are in.

Facilities and transport infrastructure:- Dry ports should have sufficient facilities to ensure efficient trans loading activities. According to UNESCAP (2010), a tractor-trailer system, a lift-truck system, a rubber-tired gantry crane system and a rail-mounted gantry crane system are the basic forms of equipment needed in dry port operations for container handling activities. Most customers are attracted by the high standard and sophisticated equipment used at dry ports for handling their valuable containers and reduces the risk of container damage, and consequently lead to on time shipment (Jarzemskis&Vailiauskas 2007). In addition, for increasing operational efficiency, modernised facilities should be invested in dry ports (Hanaoka &Regmi 2011). The implementation of a Port Community System (PCS) in Valencia dry port in Spain integrated different stakeholder into the seaport operations and maritime transport by giving support,

managing information exchange and administrative procedures in the dry port operations (Dotoli et al. 2010). Further, modernized facilities, implemented information and communication technology for container tracking facilitated the freight task between Delhi-Mumbai Kolkatta and have improved container volume (UNESCAP 2010). Road infrastructure such as highways and paved roads for high accessibility to the seaport via the dry port are essential. Rail infrastructure such as rail platforms, rail sidings and sufficient and well-maintained railway tracks are necessary for effective dry port operations (Roso, 2008). According to Andersson and Roso (2016), the inclusion of a well-developed rail and road infrastructure with value adding services at dry ports greatly improved their performance and attracted users.

Space:- Dry ports are expected to be developed with adequate space so that they can allow efficient, reliable and economical movement of containers. The space in dry ports is determined by reasonable forecasts of anticipated volumes of containers. Usually, dry ports should have provision for future expansion (UNESCAP 2010). Space capacity at dry ports can assist in solving space restrictions at seaports so as to reduce seaport congestion, promote economic development and enhance logistic integration at the seaport (Andersson and Roso 2016). The main issue that seaports face as a result of containerization is the lack of space at the seaport terminal and growing congestion on the access routes serving the terminals (Woxenius et al. 2004). Additional capacity at a dry port to support seaport operations can help reduce capacity constraints at nearby seaports and simultaneously develop a healthy cooperation between these two entities.

#### *2.1.3.5 Information sharing*

Dry ports need to be able to possess sufficient and accurate information from other players within the container freight system for moving container freight efficiently and effectively. Therefore, dry ports involved in information collaboration and coordination with other actors in the container seaport system are necessary. Information collaboration and coordination with relevant stakeholders help dry ports especially in risk sharing, asset utilization, accurate forecasting and decision making both vertically and horizontally (Christiaanse& Kumar 2000).

Information collaboration:- Some research conducted by Bichou and Gray (2004) on seaport performance measurements carried out through a logistic and supply chain management approach revealed that almost 85% of seaports showed interest in collaborating with other

intermodal terminals especially in information sharing. They believe that information sharing through EDI can develop an advanced partnership between the logistic channel partners, and that it can benefit all players in the network. Panayides and Song (2009) argue that information sharing between seaports, dry ports and other stakeholders leads to a high level of integration in the supply chain, and improve reliability, dependability and speed. In addition to this argument, information sharing through a Port Community System (PCS) between players can also reduce total distribution costs and increase efficiency in supply chain performance (Bichou&Gray 2004). A PCS is an electronic network enabling an intelligent and secure exchange of information between seaports, dry ports, freight forwarders, shippers, shipping lines, rail operators, hauliers, government bodies and other related stakeholders in a single network to execute efficiency in a supply chain (Horst &Langen 2008). The linkage between all components and various players in container seaport systems ensures that the coordination and collaboration between them is reliable for effective container transportation from one point to another in the container transportation chain.

Coordination:- Coordination is a set of methods used to manage interdependence between organizations with each organization dependent on the performance of other organizations in the chain (Horst &Langen 2008). Coordination from the entire seaport community including from dry ports, is necessary for enhancing the efficiency of dry port operations (Horst &Langen 2008). Valencia dry port faced many issues in regard to an inconsistency of information from stakeholders, and a lack of standardized procedures, as well as misinterpretation over the roles of various stakeholders. By adopting the PCS, which integrated different stakeholders into a single administration, the above mentioned issues were overcome (Dotoli et al. 2010).

### 2.2 Empirical literature

Sileshi (2020) study logistics performances of Modjo dry port operation. The major problem observed in MDP is cargo delays and waiting times at dry port. However inventory planning and management and transport management show higher performance but customer rate as average performance. The customs clearance, port infrastructure, logistics service quality, and timeless for operation performance are average. The port infrastructure and timeless affected the port logistics performance the problems such as low technological and ICT tools availability, high dwelling time, and trucks stay time in dry port indicate the port logistics performance highly

affected. Overall logistics performances of MDP by respondent rate as average performance that imply require improvement. Additionally the study recommend the MDP need to apply customer relationship management and in order to improve the logistics performance of Modjo dry port ESLSE should invest on port infrastructure and equipment by identifying bottlenecks and area where as port user customer mentioning services needs to be improving.

Rediet (2019) study determinants of Throughput Performance of Modjo Dry Port. Showed the throughput performance of Modjo dry port was found at medium level with inter-month and annual fluctuations. Further indicated the size of the port, information capital; service cost, port machinery, port infrastructure and reliability were functioning at medium level of performance but human capital functioning at a low level. Human capital was found at low level whereas the size of the port was functioning at higher level of performance. And the study recommends strategic leadership for improving the performance of Modjo dry port.

Gena, Mulugeta, and Umer (2020) study on the challenges and prospects of multimodal transport system provision and operations in Ethiopia: The case of Modjo dry port. The study identified challenges for provision of MTS, factors affecting operation and role of Modjo dry port for the MTS to manage the problems in Ethiopia. The major challenges of MTS provisions were unfinished infrastructures; lack of essential equipments for cargoes handling; unfulfilled structure with skilled personnel; absence of railway, lack of truck; poor public private partnership, low level of technology and information technology provision. Whereas, major challenges of MTS operation in Modjo were increasing rate of foreign currency; frequent theft and pilferage; lack of training and awareness creation ;high turnover rate; unbalanced trade; complex documentation and customs process; delay and congestion of cargo; un-automated service and high transport, port and warehouse fee at sea port.

Wubeshet (2018) study the contribution of MTOS with the aim of identifying the key benefits, potentials and constraints for optimization of its benefits for development of effective and efficient logistics system and trade competitiveness. Identified contributions are combined state and private transport to solve import cargo mobility, employment and income opportunity to citizens, support foreign direct investors and improved financial performance of AEO, save foreign currency, decrease demurrage cost, Source of income, expand dry port and performance and improved cargo transport operation and reduced handling cost. The major factors that hinder

operation of MTO are foreign currency problem, lack of modern ICT and transportation infrastructure in size and number, lack of competent professionals in the organization, lack of good governance and absence of competition. The study recommend in order to improve the services of MTS encourage competition between private operators and the ESLSE through possible new law or regulation by government that allow private sector to provide MTS.

Samuel (2014) study factors influencing container terminals efficiency: a case of Mombasa entry port. The factors such as inadequate quay/gantry crane equipment, reducing berth times and delays of container ships, dwell time, container cargo and truck turnaround time, custom clearance, limited storage capacity, poor multi-modal connections to hinterland and infrastructure directly influencing container terminal efficiency. Improving the infrastructures at the port of Mombasa will minimize the congestion problems. And the lack of integrated IT system poses substantial delays in custom clearance procedures. The study recommended that Kenya Port Authority has to continuously invest in modern quay and gantry cranes to supplement the current ones and enhance productivity of port operations. The government of Kenya has to invest in expanding the physical infrastructure such as adequate berthing facilities, wharves, yard capacity, quayside, railway, as well as hinterland connections expansion.

Jeevan (2016) study factors influencing dry port operations and how these impact the competitiveness of container seaports using quantitative approach of data analysis of Explanatory Factory Analysis. The EFA results show seven factors influencing dry port operations: information sharing, service features, capacity, government policy, hinterland conditions, location and administration. The results show that dry port operations have clear impacts on seaport competitiveness. These include enhancing seaport performance, increasing service variations for seaports, improving seaport-hinterland proximity, increasing seaport trade volume and enhancing seaport capacity. The outcomes reveal these seven factors affect seaport competitiveness by enhancing seaport performance, increasing service variations for seaports and improving seaport-hinterland proximity.

Blessing (2014) in his study Unlocking the landlocked describes challenges for LLDCs when implementing dry ports. Firstly, the dry port might increase transport costs in the logistics chain if charges are too high or institutional barriers are not revised, resulting in operational inefficiencies. Inefficiencies eventually decrease the total throughput, leading to dry port failure.

LLDCs must minimize both physical and non-physical barriers to trade. If not, the dry port may fail to attract customers and promote the modal shift of cargo from road to rail.

Dry port can contribute to alleviate congestion in seaports. In landlocked countries, dry port is often developed as a logistic hub to facilitate trade and custom clearance. Therefore, evaluating the factors that affect inland port and terminal operation performance is very important to overcome the problems and to achieve fully the benefits and aim of dry port establishment of dry ports in Ethiopia.

## 2.3 Conceptual Framework of the research

A conceptual framework identifies key concepts and variables in approaching research (Ravitch &Riggan 2012). It is important to identify the major factors that affect dry port or inland port and terminal operation performance through analyzing the factors that contributed to underperformance for enhancing its operation and development by developing strategies to ensure the effectiveness of this intermodal terminal in the container seaport system, and to address the research questions in this research. Therefore, influencing factors of dry port operations are identified to initiate suitable policy and strategy for enhancing a dry port's competency, which is expected to contribute positively to operation performance.

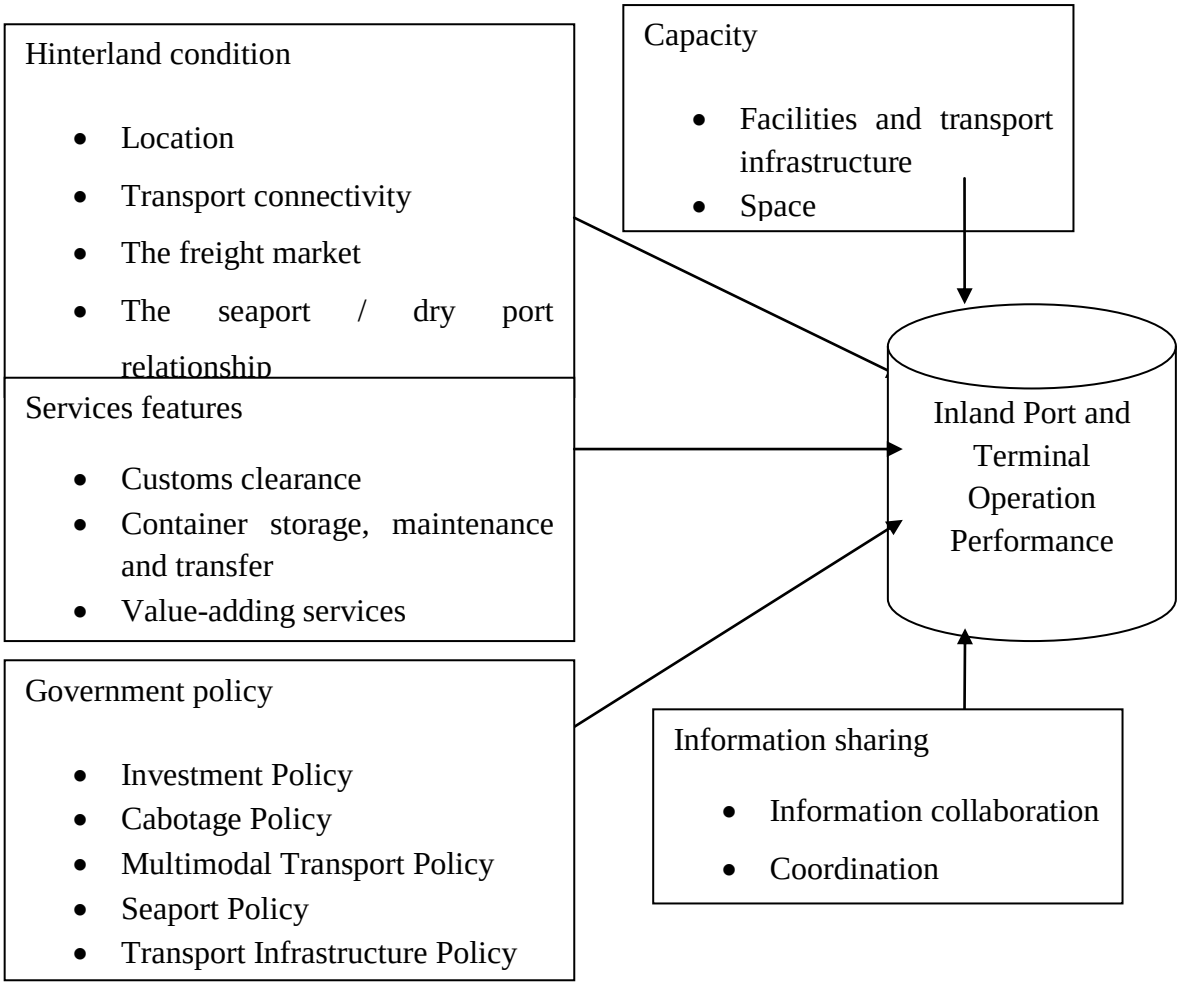


*Figure 2.1Conceptual frame work of research*

Source: Jeevan, 2016

# CHAPTER THREE

## 3. RESEARCH METHODOLOGY

This chapter presents the research approach, methods and design will be used by the study, while highlighting the population and issues related to sampling technique, sample size determination, data collection instrument. Besides, the chapter outlines the approach to data collection and analysis for the purpose of answering research questions.

### 3.1 Description of the study area

This study was conducted on Modjo dry port and terminal. MDP is one of the largest inland ports among the eight inland port of Ethiopia that owned and controlled by Ethiopian Shipping and Logistics Services Enterprise Inland ports. The Modjo dry port and terminal is located 73km south of Addis Ababa, 15km from Adama, and 553km from Djibouti Port.

### 3.2 Research Approach

This research used a mixed research approaches involving both qualitative and quantitative approaches. A mixed methods study refers to the collection or analysis of both quantities and /or qualitative data in a single study (Creswell et al., 2003). Mixed methods research is generally appropriate when your purpose is to describe, explain, or evaluate (Patricia 2017).This research employed a mixed methodology, combining qualitative and quantitative methods as the research strategy. A qualitative method provides better understanding about the inner experience of participants, explores areas not yet thoroughly researched, discovers relevant variables that can be used in the quantitative method and offers a comprehensive approach to studying the phenomena (Corbin & Strauss 2014). Then quantitative approach validates results from the qualitative method. Therefore, this research used both qualitative approach and quantitative approach to collect data from primary and secondary sources of information.

### 3.3 Research Approach

Designing a study helps the researcher to plan and implement the study in a way that will help the researcher to obtain intended results, thus increasing the chances of obtaining information that could be associated with the real situation (Creswell, 2014). Based on the purpose of research, scientific research is classified into three types: exploratory, descriptive and explanatory. This research employed an exploratory and descriptive research design method with

qualitative and quantitative phases to collect empirical data in order to answer the research questions and achieve the objectives. A descriptive research design presents and reports the way things are (Mugenda and Mugenda, 2003). Also, descriptive research design is used when data are collected to describe persons, organizations, settings or phenomena (Creswell, 2014). Kothari (2008) mentions that descriptive design has enough provision for protection against bias and ensure reliability. So this study uses descriptive research design to identify and evaluate the factors that influence the inland port and terminal operations of Modjo dry port. The research is intended to describe the factors that influence the operations of dry ports in relation to their impacts on the performance and exploratory design for discovering ideas and insights for developing strategies for further development of the dry port. Therefore, the research purpose was to have a deep view in the factors that influence the operation of inland port and terminal the researcher use descriptive and exploratory research design.

### 3.4 Research Population and Sampling

According to Patricia (2017), "the study population is the group of elements from which you actually draw your sample". Sekaran (2010) refers to population as the entire group of people or things of interest that the researcher aims to assess. The study therefore took all person involved in the operations of inland port and terminal Modjo inland port. The target population will be those who involved in day to day operation services of Modjo inland port and terminal. Therefore, Modjo Port and Terminal workers and managers, ECRA Modjo Branch office workers and managers, Custom clearing and freight forwarders workers and managers and ESLSE head office shipping and dry port sector workers and managers are our target population that directly involved in day to day operation.

#### 3.4.1 Sample Design

Sampling is the process by which you select a number of individual cases from a large population. A sample is the number of individual cases that you ultimately draw and from which/whom you generate data (Patricia,2017). Sample design deals with sample taken from the target population, method of sampling technique and sample frame. These indicated as follows: A sampling unit in the population is drawn from a sampling frame or target population that can be accessed in order to collect the required data (Creswell 2012). Therefore, this research

employed non-probability and probability sample design of convenience and stratified sampling technique for the qualitative and quantitative phase.

Convenience sampling, one of the non-probability sampling techniques in qualitative sampling helps to select the eligible participants who are willing and available to be interviewed within the sampling frame (Klassen et al. 2012). The targeted population is top level management, especially from dry ports, ESLSE head offices, ECRA Modjo Branch Office, and Custom clearing and freight forwarders. The position of the participants relevant to the research topic and the accessibility to them were considered validate the sampling list. Through the convenience sampling technique, a total of 16 participants will be selected from the above targeted population.

On the other hand for survey questioner a list-based stratified sampling technique was applied to stratify dry port stakeholders to obtain homogeneous subgroups (Collins et al. 2007). So the target respondents for this quantitative phase of research are the key stakeholders of Modjo dry ports and terminal. The population is segregated into four (4) strata which consist of Modjo dry port workers and managers, ECRA Modjo branch office workers and managers, custom clearing and freight forwarders workers and managers and ESLSE head office Shipping and dry port sector workers and managers. However, these four strata are homogenous and non-overlapping to ensure maximum representative samples. Top-and middle-level managers from the above mentioned sub populations who are directly involved in managing intermodal terminals, freight distribution and related logistic operations were invited to participate due to their experience and knowledge in dry port operations. Kenya as Kothari (2004) expresses, a sample size between 10% and 20% is considered adequate for in-depth studies. Therefore, the sample size for this study was 10%.

### 3.4.2 Sampling Frame

A sampling unit in the population is drawn from a sampling frame or target population that can be accessed in order to collect the required data (Creswell, 2014). The sampling frame describes the list of all population units from which the sample was selected (Cooper & Schindler, 2003). It is a physical representation of the target population and comprises all the units that are potential members of a sample (Kothari, 2008). Kerlinger (1986), states that a sample size of 10% of the target population is large enough. Therefore, the sampling frame for qualitative phase

is top level management, especially from dry ports, ESLSE head offices, ECRA Modjo Branch office,and custom clearing and freight forwarders from which 16 participants will be selected for interview through convenience sampling. And the sampling frame for the quantitative phase is those who participate in day to day operation of Modjo dry port and terminal accordingly: Modjo dry port workers 476, ECRA Modjo branch office workers 124, ESLSE head officesshipping and dry port sectors 78, and custom clearing and freight forwarders workers 350. The number of these people when put together is 1028. Therefore the study targeted 1028 people for the qualitative phase through survey questioner.

### 3.4.3 Sample Size

A sample is the number of individual cases that you ultimately draw and from which/whom you generate data. (Patricia,2017). Accordingly for the qualitative interview face a total of 16 samples selected for interview from top level managers of Modjo dry port and terminal four (4), ECRA Modjo branch office four (4), customs clearing freight forwarders four (4), and ESLSE head officesshipping and dry port sectors four (4). And for the qualitative questioner phase of the study as Kothari (2004) expresses, a sample size between 10% and 20% is considered adequate for in-depth studies. Therefore, the sample size for this study was 10%. Therefore, the sample size 10% will be selected through stratified sampling method from four stratums that is Modjo dry port workers stratum 48, ECRA Modjo branch office workers stratum 12, Custom clearing and freight forwarders workers stratum 35, ESLSE head offices shipping and dry port sectors 8. The number of these samples when put together is 103. So, a total of 103 survey questioners are distributed to collect data from the four stratums.

## 3.5 Data Collection

Gathering data is an important part in the research. There are several different ways to gather information, however in this study the main sources have been through interview, literature review, secondary data and data from internet. There are two major approaches to gathering information about a situation, person, problem or phenomenon. When you undertake a research study, in most situations, you need to collect the required information; however, sometimes the information required is already available and need only be extracted (Ranjit, 2011). To achieve this, the relevant data was collected through two main approaches: i) Primary data is the data that will be collected mainly from top level managers of dry ports and ECRA Modjo branch office,

ESLSE head offices, freight forwarders through interview for the qualitative phase that sequentially will be employed first. Additionally, using survey questioner primary data was collected from Modjo dry port workers, ECRA Modjo Branch office workers, custom clearing and freight forwarders workers and ESLSE head offices shipping and dry port sectors workers through structured survey questioner both open and close ended. Field observation also was made. Quantitative and qualitative secondary data also gathered from reports of ESLSE head office and Modjo branch office, article journals, book and ECRA reports and relevant literatures from internet.

### 3.6 Data Analysis

The data was collected through interview, survey questioner and secondary data from different sources. The researcher organized and prepared the various data depending on the sources of information. Moreover, in order to ensure consistency of data, editing was carried out by the researcher. Once editing has done, data were analyzed qualitatively and quantitatively. The qualitative data that collected through open-ended survey questioner and interview analyzed using grounded theory. For quantitative data Exploratory Factor Analysis (EFA) was done by using SPSS (Version 26) software packages. Statistical techniques of descriptive and inferential statistical analysis techniques employed. Finally the outcome of the project was presented on written material and detailed oral presentation.

### 3.7 Scale Reliability and Validity

This thesis was built on the previous academic articles and books with the case study, and then the further view is given by the author. The reliability and validity shows the accuracy and the correctness of the conclusion.

#### 3.7.1 Reliability

The reliability and validity shows the accuracy and the correctness of the conclusion therefore its important to check reliability and validity when performing a research. Reliability aim to secure that the measuring instrument should not generate any random errors. Reliability refers to the quality of a measurement procedure that provides repeatability and accuracy. (Ranjit, 2011). According to Zikmud et al (2010) Cronbach's alpha is a measure for the internal consistency of items to the concept. Scales with coefficient alpha between 0.8 and 0.95 are considered to have

very good reliability, scales with coefficient alpha between 0.7 and 0.8 are considered to have good reliability and coefficient alpha between 0.6 and 0.7 indicates fair reliability.

Table 3.1 Summary of Cronpach's Alpha value

| | **Reliability Statistics** | |
|---|---|---|
| | Cronbach's Alpha | Number of Items |
| Hinterland condition factor | 0.889 | 5 |
| Capacity factor | 0.865 | 5 |
| Service feature factor | 0.896 | 7 |
| Information sharing factor | 0.833 | 4 |
| Government policy factor | 0.774 | 6 |
| For all | 0.953 | 27 |

Source: survey own computation (2022).

The above table 3.1 the overall reliability showed 0.953 which are very good reliability. On the other hand all factors had individually had Alpha greater than 0.8 which means very good reliability except government policy factor which had good reliability of 0.774.

### 3.7.2 Validity

Valid research relates how the author collects and analyzes the data. It includes the appropriate research strategy, the suitable techniques of relevant data collection and the way of analysis. (Biggam 2008,). The research strategy for this thesis is the case study with grounded theories. It can analyze the real circumstances with proper scientific theories. The validity is the measuring instrument should not generate systematic errors. Therefore this study addressed content validity through the review of literature and adapting instruments used in previous research.

## 3.8 Ethical Consideration

Ethical issues consideration on study was necessary for the purpose of ensuring the privacy as well as the safety of the respondent. Since the researcher used the data from interviewers which were collected through interview. The confidentiality of the participants will be ensured by their willingness and interest. Only relevant details that helped in answering the research questions were included. Hence, this study fully considered the ethical matters of all the individuals involved in the study. Additionally, the researcher strongly followed all ethical consideration throughout the research process to meet all ethical conditions.

# CHAPTER FOUR

## 4. RESULTS, DISCUSSIONS AND INTERPRETATIONS

### 4.1 Introduction

This chapter deal with data presentation, analysis, and interpretation of data obtained through survey questionnaire, interview and secondary source of data together. The analysis method employed was the descriptive and exploratory factor analysis (EFA) method to analyze the data collected from interview and survey questionnaire. The result collected from 101 respondents through survey questioner, from 12 interview participants and secondary data were discussed and analyzed by answering research questions to attain the research objectives.

### 4.2 Response rate and demographic data

The primary data were collected through survey questioner and interview. The survey questioner collected quantitative and qualitative data from 101 employees of four stratums out of 103 distributed survey questioner. A total of 101 responses were received, achieving a response rate of 98%. The response rate gives a reasonable weight and credibility to this research. Table 4.1 presented result of the response rate of respective group surveyed. Accordingly, response rate of 47 (97.9%) from MDP, 12 (100%) from ERCA, 34 (97.1%) from custom clearing and freight forwarding (CCFF) and 8 (100%) from ESLSE head office were received. Regarding the response rate all had the highest response rate.

Table 4.1 Response rates for the survey questioner.

| Stratum | Population | Sample size | Response received | Response received |
|---|---|---|---|---|
| MDP workers | 480 | 48 | 47 | 97.9% |
| ERCA workers | 120 | 12 | 12 | 100% |
| Custom clearing and freight forwarding workers | 350 | 35 | 34 | 97.1% |
| ESLSE head office workers | 80 | 8 | 8 | 100% |
| Total | 1028 | 103 | 101 | 98% |

On the other hand the demographic information from the survey was used to review the characteristics of respondents and presented under here on Table 4.2 and Table 4.3.

Table 4.2 Demographic information of survey questioner respondents

| Variable | Category | Frequency | Percent % |
|---|---|---|---|
| Gender | Female | 32 | 31.70% |
| | Male | 69 | 68.30% |
| Age | 20 up to 30 | 21 | 20.80% |
| | 31 up to 40 | 62 | 61.40% |
| | 41 up to 50 | 14 | 13.90% |
| | Above 50 | 4 | 4.00% |
| Education | Certificate | 4 | 4.00% |
| | Diploma | 8 | 7.90% |
| | First Degree | 70 | 69.30% |
| | Second Degree | 18 | 17.80% |
| | Other | 1 | 1.00% |
| Position | Officer | 31 | 30.70% |
| | Senior Officer | 34 | 33.70% |
| | Coordinator | 14 | 13.90% |
| | Manager | 9 | 8.90% |
| | Other | 13 | 12.90% |
| Work experience | 1-5 Years | 24 | 23.80% |
| | 6-10 Years | 46 | 45.50% |
| | 11-15 Years | 21 | 20.80% |
| | Above 15 Years | 10 | 9.90% |

Source: Research data, 2022

The above Table 4.2 presented summary of survey questioner respondents' demographic characteristics. The gender of respondents' was 69 (68.3%) male and 31 (31.7%) female. The characteristics of age of 21 (20.8%) was between 20-30 years, 62 (61.4%) was between 31-40 years, the 14 (13.9%) was between 41-50 years and the remaining 4 (4%) were above 50 years. According the age distribution of the respondent's majority of them found between age group of 31-41 years. In addition the educational level of the respondents the data showed that, 70(69.3%) and 18 (17.8%) of respondents found education level of first Degree and second-Degree holders respectively. The rest 13(12.9%) was Diploma, high school and other holder. According to the

data level of education the respondents were dominated by first and second Degree holders. Concerning the position and status of the respondents the result indicate that 9(8.9%) were manager, 14(13.9%) were coordinator, 34(33.7%) were senior officer, 31(30.7%) were officers, and 13 (12.9%) were others i.e. directors of ESLSE and MDP and owners of customs clearing and freight forwarding company. From the above result the data indicate that the respondents were from different position and status of organization however most respondents were higher level that had enough knowledge about the dry port. With related to the employee work experience in the organization 10 (9.9%) were above 15 years, 21 (20.8%) were between 11-15 years, 46 (45.5%) were between 6-10 years and the remaining 24 (23.8 %) were between 1-5 years of work experience. This indicates the respondent's had good enough knowledge regarding the MDP as most of the employee is well experienced.

In addition the demographic characteristics of interview participants were presented in the Table 4.3 below this. The response rate was 12(75%) from a total of targeted 16 participants.

Table 4.3 Demographic profile of interview participants

| No | Organization | Position | Experience in years | Duration |
|---|---|---|---|---|
| 1 | ESLSE | Shipping operation department director | 37 | 1 Hr |
| 2 | ESLSE | Inland port operation coordination manager | 9 | 1 Hr |
| 3 | MDP | Director | 13 | 1 Hr |
| 4 | MDP | Port and terminal manager | Above 10 | 1 Hr |
| 5 | MDP | Train operation team coordinator | Above 1 | 45 Min |
| 6 | MDP | Customer services coordinator | 9 | 45 Min |
| 7 | MDP | Warehouse head | 10 | 50 Min |
| 8 | MDP | Terminal operation department manager | 14 | 1 Hr |
| 9 | CCFF | Senior transistor | Above 10 | 35 Min |
| 10 | CCFF | Senior transistor | Above 7 | 45 Min |
| 11 | CCFF | Owner | 10 | 45 Min |
| 12 | CCFF | Owner | Above 10 | 45 Min |

Source: Own Survey, 2022

In the above Table 4.3 the demographic characteristics of 12 interview participants from ESLSE Head Office ESLSE, Modjo dry port(MDP), and Custom clearing and freight forwarders(CCFF).

The ECRA Modjo branch office managers and workers responded as we can fill the questioner but regarding interview the questions was related to the dry port so it's better to made with MDP workers. Additionally, some of ESLSE Head Office higher level managers was not willing to cooperate do to this the remaining two quota of ESLSE Head Office transferred to MDP. According to Table 4.3 of the 12 respondent's, two of them are director, three are manager, two were freight forwarding company owner and the remaining were coordinator and seniors. In respect to the respondent's work experience except the one participant all had more than seven years of experience. There was a interview participant that had 37(thirty seven) years of experience. Accordingly, the demographic profile of the participants indicates the participants were very relevant. Therefore, respondents with more working experience are expected to provide more precise information than those with less experience, which ensures the quality of the research (Eshuis et al. 2013)

### 4.3 Results

In order to answer research question and attain research objective of the study the qualitative and quantitative results of survey questioner, interview and secondary data was presented. The result of primary data collected through survey questioner from 101 respondents and 12 interview participants and the secondary data will be presented under here. The survey questioner results had two parts that is the first part were close ended questioner with 27 question that employed to collect the quantitative data and the second part were open-ended questioner question with 4(four) question employed to collect qualitative data. Additionally, the interview had 5(five). Therefore, in this section the result of qualitative data collected through open-ended survey questioner and interview will be presented first using descriptive analysis and in the next section the result of quantitative data collected through close-ended survey questioner and quantitative data collected from secondary source of the organization will be presented using descriptive and inferential statistics.

#### 4.3.1 Qualitative result of influencing factors of dry port operation performance

The qualitative results of the study were the result of primary data collected through open-ended survey questioner question part and interview.

Results from open-ended survey questioner question

In order to attain the research objectives and answer the basic research question the following question were provided to the respondents and the result was presented according to the research question by combining the respondents answer based on similarity and literature review. The respondent answer presented with the question as follows:

Question one: what factors do you think contribute greatly to the underperformance of Modjo inland port and terminal operation?. Answers of the respondent:

- ✓ Occasional failure of network system (ICT infrastructure of information sharing factor).
- ✓ Customs inefficiency (customs inspection service of service feature factor).
- ✓ Lack of coordination among stakeholders (lack of coordination of information sharing).
- ✓ Lack of terminal operating system (Location problem inside the terminal of the port).
- ✓ Lack of safety and security procedures(administration and safety and security at dry port of feature factor)
- ✓ Absence of competition(relationship with dry port and sea port or from private sector government policy factor)
- ✓ Local transport assigned by the dry port (Provision of transport for short distance transport of government policy factor).
- ✓ Lack of equipment (availability of modern and sophisticated equipment of capacity).
- ✓ Lack of well-trained employee and improved management system (human resource).
- ✓ Absence damage container maintenance (value adding services of service feature).
- ✓ Lack of terminal for export containers (sufficient space for full containers of capacity).
- ✓ Empty container problem and shortage of container (Covid and ESLSE capacity factor)
- ✓ Internal conflict or war in our country and world i.e. Russia vs Ukraine (peace and security factor of political factor).
- ✓ Expensive container deposit amount (financial problem of economic factor)
- ✓ Customers financial capacity problems (financial problem of economic factor)

Question two: what are other factors that not included in the above factor that affect operation of Modjo dry port and terminal performance? If any. Answers of the respondent:

- ❖ Employee and management capability (Human resource factors)
- ❖ War and peace and security (Political stability factors)
- ❖ Financial problem (Economic factors).

Question three: how do you think the dry port overcome this factors that contribute to operation underperformance in dry port and terminal operation? Answers of the respondent:

- ✓ Applying best international logistics experience and establish research and development.
- ✓ Strengthening security guard and building fence.
- ✓ Develop online port operation system for customers like customs.
- ✓ Application Terminal operating system application.
- ✓ Continuous provision of capacity building of training and leadership leading capability.
- ✓ Open the market for competition through opening market for private to create competition.
- ✓ Cooperation with stakeholders to improve space utilization by decreasing dwell time and enhance information sharing.
- ✓ Stability of the country
- ✓ Focus only on the core organization services
- ✓ Increase controlling mechanism on empty container return and provide additional container. and adding container ship.
- ✓ Stability of the country

Results from interview question

In order to attain the research objectives by answering the basic research question of what are the major factors that affect MDP operations performance and how these factors contribute to the underperformance of Modjo inland port five interview questions were the provided to the 12 respondents and the result was presented here under. Therefore, the result of combined participant answers based on similarity of the answers and grounded theory from literature presented with the question presented as follows:

Question one: what are the factors that influence dry port operations?. Answers of the respondent:

- Area of dry port (location of dry port i.e. hinterland condition factor).
- Rail and road connectivity direct to Djibouti sea port (transportation connectivity of hinterland condition factor).

- Stake holders that provide services factor (Custom and inspection services and other regulatory body like standardization , health and others of service feature factors).
- Equipment and port machinery (availability of sufficient equipment for loading and unloading containers and bulk cargoes of capacity factor).
- Space of the terminal and warehouse for export and import (sufficient space for full and empty containers of capacity factor).
- Coordination to solve limitation (coordination for risk sharing of information sharing).
- System (ICT infrastructure and technology) (coordination for facility utilization of capacity factor).
- Integrated system implementation (providing information for accurate decision making of information sharing factor).
- Online system between ESLSE and customers (information of container flow forecasting of information sharing factor).
- Policy incentive by the government (multimodal transport infrastructure development policy of government policy factor).
- Currency problem, financial capacity and expensive container deposit amount (finance problem of economic factor).
- Well trained man power (man power of human resource factor).
- War and political instability (peace and security of the country of political factor).

Question two: what are the major factors affecting operation performance of Modjo currently?.

Answers of the respondent:

- Time of rail way arrival (due to power, peace and stability, weather condition and waiting of trucks) (adequate railway truck transport connectivity of capacity factor).
- Customs procedure (restrict and long) (custom and inspection services feature factor).
- Security (administration and safety and security at dry port services of service feature).
- Container taken by customs (information collaboration and coordination for risk sharing of information sharing factor).
- Export terminal is not availability (sufficient space for full and empty containers of capacity factor).
- System (ICT and yard) (providing information for accurate decision making of information sharing factor).

- Outsourcing of warehouse management system controlling mechanism to i.e. source code belongs to oracle company (information of container flow forecasting of information sharing).
- Local transportation assignment for full out containers by the MDP (provision of transport for short distance of government policy).
- Currency problem, financial capability and container deposit expensiveness (financial problem of economic factor).
- War and political instability (peace and security of the country of political factor).

Question three: how these factors contribute to under performance of Modjo dry port and terminal?. Answers of the respondent:

- By decreasing warehouse and terminal efficiency and productivity.
- By increasing the service delivery time or average dwell time of services and decreasing quality of service.
- By affecting reliability and accuracy of services delivery efficiency.
- By increasing dwell time, cost and decreasing freight market due to negative impact on performance of customers.
- By decreasing the volume of import and export and higher price which affect macroeconomic stabilization.

Question four: do you think this factors impacted overall transport cost and dwell time for customers? Answers of the respondent:

- Yes, Dwell time increase productivity will decrease this will leads to high cost for customers.

Question four: what are the impact of Modjo dry port and terminal on Djibouti port competitiveness? Answers of the respondent:

- Yes, by providing space.

### 4.3.2 Quantitative results influencing factors of dry port operation performance

The quantitative results of the study were the result of primary data collected through close-ended survey questioner of 27 influencing factors of dry port operation performance question

and quantitative secondary data from the report of the organization that support to attain the research objectives and answer the basic research question. The result of quantitative data on influencing factors of dry port operation performance presented using descriptive and inferential statistical analysis. The quantitative data on factors of dry port operation performance with dependent variable operation performance and independent variable influencing factors collected using Likert scale items. Likert scale items to ensure parametric nature of the data and allow the use of parametric data analysis statistical tool. Accordingly, the result was presented analyzed using descriptive statistics of mean and standard deviation computed for each factor and inferential statistics computed using Exploratory Factor Analysis (EFA).

The descriptive statistics result presented using mean and standard deviation descriptive statistics of influencing factors of Modjo dry port operation. The result illustrated the parametric nature of the data due to the mean score result showed no presence of extreme scores and the standard deviation of all variable found more than one. Table 4.4 depicts the descriptive statistics of this construct based on five major influencing factors of dry port operation categories namely hinterland conditions, service features, capacity, information sharing, and government policy. Accordingly, the service features factors had the highest grand mean of 3.59 and government policy had the lowest grand mean of 3.31. On the other hand the capacity sub factors of sufficient space for full containers had the highest mean of 3.86. This indicates that sufficient space for full containers had major influence on Modjo dry port and terminal operation performance. But the government policy sub factor of public-private investment and private ownership had the lowest mean of 3.05 values. This indicates that two sub factors of government policy had the lowest influence on Modjo dry port and terminal operation performance. Overall, all result showed that the mean value of between 3.05 up to 3.86, indicating that they are very important factor for inland port and terminal operation performance.

Table 4.4 Descriptive statistics of influencing factors of Modjo dry port operation.

| Factors | Question:- How important are the following for influencing Modjo dry port operations? | Mean | St.dev | Grand Mean |
|---|---|---|---|---|
| Hinterland condition | Location | 3.24 | 1.29 | 3.57 |
| | Road connectivity to seaport | 3.78 | 1.222 | |
| | Rail connectivity direct to Djibouti sea port | 3.85 | 1.276 | |
| | Availability of Freight market | 3.48 | 1.27 | |
| | Cooperation with Djibouti sea port | 3.5 | 1.23 | |
| Services features | Provision of value adding services | 3.41 | 1.15 | 3.59 |
| | Rail- truck container transfer | 3.53 | 1.196 | |
| | Custom and inspection services | 3.59 | 1.133 | |
| | Availability of sufficient equipment | 3.73 | 1.174 | |
| | Administration and safety and security at dry port | 3.69 | 1.206 | |
| Capacity | Modern and sophisticated equipment | 3.51 | 1.064 | 3.57 |
| | Well maintained equipment | 3.43 | 1.099 | |
| | Adequate highways and wide roads | 3.44 | 1.161 | |
| | Adequate railway truck | 3.58 | 1.194 | |
| | Sufficient space for full containers | 3.86 | 1.183 | |
| | Sufficient space for empty containers | 3.77 | 1.139 | |
| | Space utilization via collaboration | 3.39 | 1.058 | |
| Information sharing | Coordination for risk sharing | 3.34 | 1.116 | 3.46 |
| | Coordination for facility utilization | 3.38 | 1.008 | |
| | Providing information for accurate decision making | 3.54 | 1.204 | |
| | Information of container flow forecasting | 3.58 | 1.125 | |
| Government policy | Public ownership | 3.45 | 1.053 | 3.31 |
| | Private ownership | 3.05 | 1.195 | |
| | Public-private investment | 3.05 | 1.099 | |
| | Provision of transport for short distance transport | 3.36 | 1.128 | |
| | Multimodal transport infrastructure development | 3.68 | 1.148 | |
| | Sea port(Land side policy) | 3.28 | 1.297 | |

Source: Own Survey, 2022

#### *4.3.2.1 Exploratory factor analysis*

Exploratory factor analysis was applied to validate and explore the relationship among the factors that influence Modjo dry port and terminal operation and the impact on the operation performance of the port and terminal. The objective of the research was to evaluate the factors that influence Modjo dry port and terminal operation. According to Hurley (1997), the EFA technique is suitable for factor exploration and evaluation compared to confirmatory factor

analysis. Therefore, the quantitative result of EFA assisted by SPSS version 26 presented using inferential statistical analysis by tables and graphs. Before conducting an EFA, data suitability should be checked to produce valid and reliable results (Pallant 2011). Accordingly, the following assumption has been made:

Assumption:

1. Sample size: the suggested sample size for factor analysis needs to be more than 100 and the sample size for this research is 101, it implies the suitability of factor analysis for it.
2. Assumes reliable correlations are highly affected by missing data and outliners. A correlation coefficient on a maximum value of +/- 0.5 is practically significant, with +/- 0.4 as important and +/- 0.3 considered a minimum value and in this research there is no missing data.
3. Normality: Univarate-normally distributed variables make the solutions stronger. Uniformly high communalities value without cross loading shows strong data for factor analysis (Costello 2005). Bartlett's Test of Sphericity should be significant at $p < 0.05$, which indicates adequate correlations among variables to support the normal basis for factor analysis (Pallant 2011). And in this research Sig is 0.000 that was less than 0.5.
4. The Kaiser-Mayer-Olkin (KMO) index should be at least 0.60 which ensures the suitability of data for extraction of factors (Rovai et al. 2013).
5. Parametric data are required for factor analysis (Pallant 2011). Normality in factor analysis can be measured by the skewness and kurtosis value which should between +/- 1.00 (Minckler 2011).

Besides the above assumptions factor principle component analysis (PCA) extraction and rotation method were employed. The factor extraction method provides a solution with several variables explaining the maximum variance of the data and it's important to employ the factor extraction method to provide a clear factor structure (Rovai 2013). PCA reduces a large number of variables to a smaller set of components that account for a large amount of observed variance. There are several criteria proposed by Williams et al. (2010) to fix the number of factors, including Kaiser's criteria (eigenvalue > 1) and the number of factors above the point of break in a screen plot. It aims to retain most of the conceptual sense which explains more than 60% of the total variance (Hair et al. 2010). A rotation method aims to assist in obtaining a new set of factor loadings from a given set. In this research, Orthogonal varimax rotation that aims to maximize the sum of variances of squared loadings in the columns of the factor matrix to produce loading

in each column from a high value to zero value, which facilitates the interpretation has been applied because it determines the adequacy of rotation and assumes that the generated factors are independent. In addition, interpretation is a crucial section of EFA and requires subjective, theoretical and pragmatic procedures to develop meaningful latent factors. Depending on the above assumptions, the suitability of data for EFA, extraction and rotation method in this research was addressed and the explanation of the results presented in the following sections.

First of all before performing EFA the research data suitability was examined based on the assumptions. So, the sample size was 101 that imply the suitability of factor analysis for it. The values of correlation coefficient among the variables were showed strong enough for factor analysis and met the assumption of correlation coefficient on a maximum value of +/- 0.5 is practically significant, with +/- 0.4 as important and +/- 0.3 considered a minimum value. Additionally, KMO index were 0.900 above the recommended value 0.60 supported sampling adequacies in this research. The Bartlett's Test of Sphericity was statistically significant Sig 0.000 ($p < 0.05$), which showed that variables were correlated for a reasonable factor analysis.

Table 4.5 KMO and Bartlett's Test

| **KMO and Bartlett's Test[a]** | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | 0.9 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 1966.33 |
| | df | 351 |
| | Sig. | 0 |
| a. Based on correlations | | |

Source: Own Survey, 2022

Based on the research outcome the variables are fit for procedure of factor analysis. So, the next were determining the optimum loading values. According to Hair et al. (2010) loading size based on sample size and indicated 0.5 loading size for a sample size of 101-120. In this research the sample size was 101, so the appropriate loading size will be 0.5. Although there is no firm standard to determine the optimum loading values, Comrey and Lee (1992) offer a guideline for interpreting the loading as follows: 0.71= (excellent), 0.63 = (very good), 0.55= (good), 0.45= (fair), and 0.32 = (poor). They indicated that variables with the loadings value of more than 0.5 assist the researcher in drawing a definite conclusion about the component. Therefore, in this research the variables with a loading value of more than 0.5 will be retained to make certain assumptions of the factors influencing dry port operations performance.

From the identified 27 variables during the literature review five components or variables demonstrated a cumulative percentage variance of 67.98% and had an eigen value > 1 as

indicated in table 4.6 in the below. In addition, the loadings and items in each component so the variables with a loading value of more than 0.50 were retained for discussion.

Table 4.6 Total variance explained for responses

| **Total Variance Explained** | | | |
|---|---|---|---|
| Component | Initial Eigenvalues | | |
| | Total | % of Variance | Cumulative % |
| 1 | 12.486 | 46.245 | 46.245 |
| 2 | 2.277 | 8.432 | 54.676 |
| 3 | 1.523 | 5.640 | 60.316 |
| 4 | 1.065 | 3.944 | 64.261 |
| 5 | 1.005 | 3.722 | 67.983 |
| 6 | 0.937 | 3.469 | 71.452 |
| 7 | 0.854 | 3.163 | 74.615 |
| 8 | 0.761 | 2.818 | 77.433 |
| 9 | 0.744 | 2.756 | 80.190 |
| 10 | 0.641 | 2.374 | 82.564 |
| 11 | 0.571 | 2.115 | 84.679 |
| 12 | 0.509 | 1.886 | 86.564 |
| 13 | 0.455 | 1.684 | 88.248 |
| 14 | 0.444 | 1.643 | 89.891 |
| 15 | 0.362 | 1.342 | 91.234 |
| 16 | 0.342 | 1.267 | 92.501 |
| 17 | 0.314 | 1.164 | 93.665 |
| 18 | 0.274 | 1.014 | 94.680 |
| 19 | 0.230 | 0.850 | 95.530 |
| 20 | 0.223 | 0.827 | 96.357 |
| 21 | 0.197 | 0.729 | 97.086 |
| 22 | 0.191 | 0.706 | 97.792 |
| 23 | 0.160 | 0.594 | 98.386 |
| 24 | 0.135 | 0.502 | 98.887 |
| 25 | 0.115 | 0.428 | 99.315 |
| 26 | 0.108 | 0.398 | 99.713 |
| 27 | 0.077 | 0.287 | 100.000 |
| Extraction Method: Principal Component Analysis. | | | |

Source: Own Survey, 2022

The below graph 4.1 indicates the cutoff point of screen plot. Which means only five components had eigen value more than one. And indicated that the five variables had an eigen value > 1 and demonstrated a cumulative percentage variance of 67.9851%. Which means 67.98% variance were explained by these five variables.

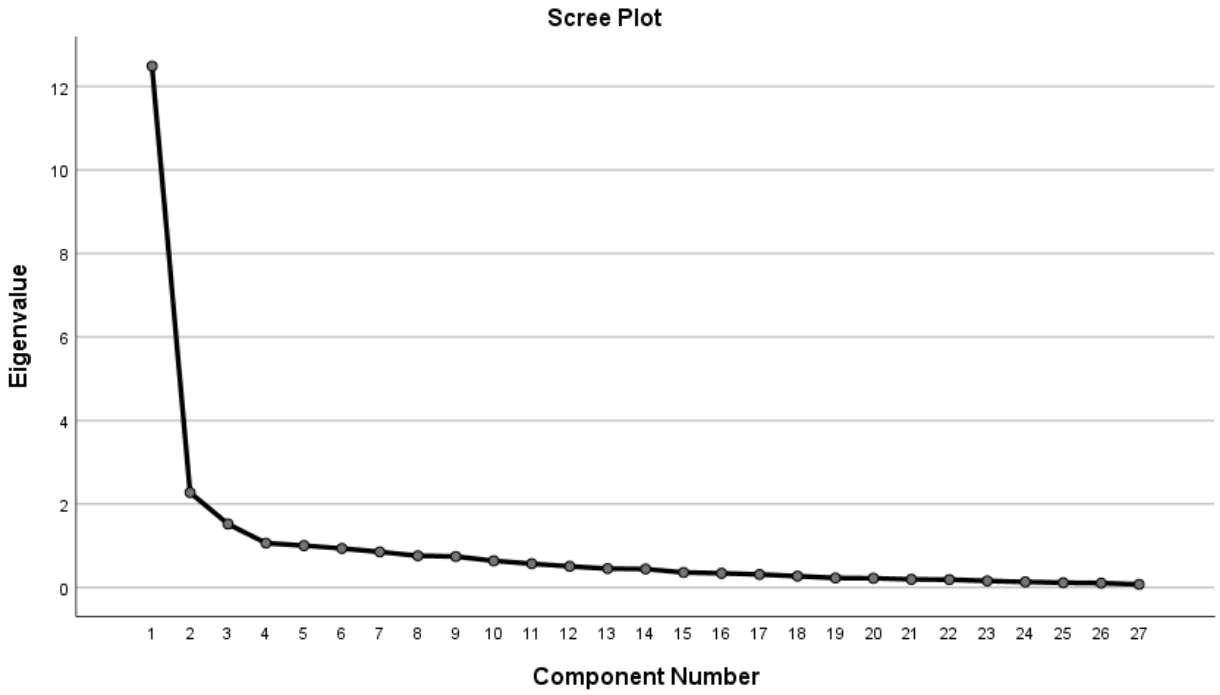


*Figure 4.1: Screen plot*
Source: Own Survey, 2022

Additionally, Table 4.7 shows the rotated component matrix. In the rotated component matrix the five components or factor were identified with 15 items. The left 12 items or variables were suppressed during extraction method due to their loading value less than 0.50 and the sub factor found in other factor. Accordingly, the first component or factor consisted of three items or sub-factors with excellent loading (between 0.726-0.838). The second component had two sub-factors with good loadings (0.515 and 0.570). The third component had three sub-factors with two excellent loading (of 0.831 and 0.827) and one good loadings (of 0.575). The fourth component had two sub-factors with one very good loading (of 0.670) and one good loadings (of 0.542). Finally, the fifth component had one sub-factors with excellent loading (of 0.753). The

rotated component matrix was made using principal component analysis extraction method and Varimax Kaiser Normalization of rotation method. The validity and reliability of EFA results showed the Cronbach's Alpha coefficient of a reliability test by value for rotated variables was 0.889 (component one or hinterland condition), 0.865 (component two or service features), 0.896 (component three or capacity), 0.833 (component four or information sharing), and 0.774 (component five or government policy) which indicated a high reliability of the results. Based on the outcome of the rotated component matrix the variables with a loading value of more than 0.50 were retained for discussion.

Table 4.7: Rotated component matrix

| **Rotated Component Matrix[a]** | | | | | |
|---|---|---|---|---|---|
| | Component | | | | |
| | 1 | 2 | 3 | 4 | 5 |
| Its location near to industrial zone and manufacturing areas | 0.726 | | | | |
| Its Road connectivity direct to Djibouti sea port | 0.838 | | | | |
| Its Rail connectivity direct to Djibouti sea port | 0.795 | | | | |
| Administration and safety and security at dry port | | 0.515 | | | |
| Provision of value adding services it provides to customers | | 0.570 | | | |
| Sufficient space for empty containers | | | 0.575 | | |
| Space utilization via collaboration | | | 0.803 | | |
| Coordination for risk sharing | | | 0.827 | | |
| Providing information for accurate decision making | | | | 0.542 | |
| Information of container flow forecasting | | | | 0.670 | |
| Public ownership | | | | | 0.753 |
| Extraction Method: Principal Component Analysis.<br>Rotation Method: Varimax with Kaiser Normalization. | | | | | |
| a. Rotation converged in 17 iterations. | | | | | |

Source: Own Survey, 2022

#### *4.3.2.2 Container throughput by dry ports*

In addition to the above qualitative and quantitative primary data quantitative data result from secondary source were presented under here to validate results from primary source of data.

Table 4.8 container throughput in TEU

| Dry port | | Modjo | Kality | DireDawa | Semara | Kombolcha | Mekele | Total |
|---|---|---|---|---|---|---|---|---|
| 2008 | plan | 379,608 | 77,946 | 12,147 | 2,025 | 11,135 | 23,283 | 506,144 |
| | Actual | 484,163 | 73,440 | 17,664 | 3,781 | 12,279 | 25,831 | 617,158 |
| 2009 | plan | 532,685 | 79,556 | 19,849 | 4,856 | 12,935 | 28,215 | 678,096 |
| | Actual | 534,376 | 81,477 | 14,036 | 8,027 | 17,512 | 26,344 | 681,772 |
| 2010 | plan | 555,672 | 92,970 | 17,910 | 10,474 | 20,303 | 29,722 | 727,051 |
| | Actual | 520,167 | 73,947 | 16,612 | 7,229 | 11,752 | 29,008 | 658,715 |
| 2011 | plan | 542,268 | 77,904 | 18,456 | 7,708 | 12,676 | 30,212 | 689,224 |
| | Actual | 507,776 | 88,136 | 14,618 | 8,026 | 18,852 | 29,480 | 666,888 |
| 2012 | plan | 581,866 | 83,591 | 19,802 | 8,270 | 13,602 | 32,418 | 739,546 |
| | Actual | 541,402 | 74,944 | 15,819 | 8,025 | 21,471 | 37,139 | 698,800 |
| 2013 | plan | 470,333 | 65,953 | 13,908 | 8,065 | 17,311 | 21,915 | 597,485 |
| | Actual | 459,710 | 76,541 | 13,546 | 7,000 | 18,343 | 14,265 | 589,405 |

Source: ESLSE dry port sector report.

In the above Table 4.8 the container throughput of the six dry port from 2008E.C to 2013E.C provided. This quantitative data shows as the total container throughput fall in 2013E.C in the all dry port except Semara dry port. This indicate the economic and political factor were a major factor that affect dry port operation performance.

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | Sig. |
|---|---|---|---|---|---|
| | | | Std. Error | Beta | |
| | HC | | 0 | 0.248 | 0 |
| | SF | | 0 | 0.224 | 0 |
| | CP | | 0 | 0.294 | 0 |
| | IS | | 0 | 0.173 | 0 |
| | GP | | 0 | 0.225 | 0 |

a. Dependent Variable: OPP

### 4.4 Discussion and interpretation of results

An interview was made and the result was combined based similarity depending on literature review. Accordingly, the factors that influence dry port operations were availability of sufficient equipment for loading and unloading containers and bulk cargoes, sufficient space for full and empty containers, and coordination for facility utilization capacity factors. The hinterland condition factors were area of dry port (location of dry port) and rail and road connectivity direct to Djibouti sea port (transportation connectivity). The service feature factor were dry port, custom and inspection services, health and other regulatory body like standardization and etc. The information sharing factor that influence dry port operations the interview participants indicates were coordination to solve limitation (coordination for risk sharing), integrated system implementation (providing information for accurate decision making) and online system between ESLSE and customers (information of container flow forecasting). And the government policy factor that influence dry port operations the interview participants indicates was policy incentive by the government (multimodal transport infrastructure development policy). Finally, the additional factor that influence dry port operations the interview participants indicates were economic or financial factors such as currency problem, financial capacity of the customers and expensive container deposit amount and human resources factors such as well trained man power and political factor such as war and peace and security .

On the other hand, the major contributing factor of MDP operation underperformance. Capacity factors were availability of modern and sophisticated equipment, lack of terminal or lack of sufficient space for full containers and empty container problem and shortage of container that arise due to Covid 19 and still is there. The hinterland condition factor was lack of terminal operating system and location problem inside the terminal of the port. The service feature factor were customs inefficiency of customs inspection service, lack of container maintenance of value adding services, and lack of safety and security procedures due to unavailability of fence. The information sharing factor was occasional failure of network system and lack of coordination among stakeholders. The government policy factor were absence of competition and relationship with dry port and sea port or from private sector and local transport assigned by the dry port that is provision of transport for short distance transport. Other factors that contributed for MDP operation underperformance were internal conflict or war in our country and world i.e. Russia vs Ukraine i.e. peace and security factor of political factor, expensive container deposit amount and

customers financial capacity problems i.e. financial problem of economic factor. These factors influencing operation performance contributed to under performance of Modjo dry port and terminal by decreasing warehouse and terminal efficiency and productivity, by increasing the service delivery time or average dwell time of services and decreasing quality of service, through affecting reliability and accuracy of services delivery efficiency and by decreasing international trade volume and destabilization of macroeconomic.

According to Andersson and Roso (2016), the inclusion of a well-developed rail and road infrastructure with value adding services at dry ports greatly improved their performance and attracted users. This indicates that direct road and rail connectivity had to be supported by adequate highways, wide roads and adequate railway truck to improve MDP operation performance. Even though the respondents indicated that MDP was not working at its full capacity due the war in the country and economic instability. The capacity problem influencing the Modjo dry port operation that indicated by respondents were related to space utilization via collaboration by indicating that sufficient space for full and empty container are the major determinant or the most important factors for efficient and effective operation of dry port. The productivity of port equipment depends highly on space at the terminal. According to descriptive result on the respondents indicated the level of importance the factor had on influencing the dry port and terminal operation performance  availability of modern and sophisticated equipment 54.6 percent, well maintained equipment 50.6 percent, adequate highways and wide roads 48.5 percent, adequate railway truck 59.6 percent, sufficient space for full containers 70.7 percent, sufficient space for empty containers 63.6 percent and space utilization via collaboration 71.7 percent of respondents were strongly agreed their level of importance in influencing MDP.

However, most of respondents from Modjo dry port on open ended part of the survey questioner indicated the capacity problem that currently MDP is facing arise from stakeholders side i.e. importers and customs. As they indicate some of the importer had an attitude of using the dry port as storage or warehouse this will lead to higher dwell time of cargoes at the MDP and also impacted the port equipment by increasing unnecessary shifting fuel cost due to unproductive activity in the terminal and inefficient space utilization capacity of the dry port. On the other hand the customs clearing and freight forwarding respondents indicated as MDP had space capacity problem due to lack of space for full export container that had a great impact of

reliability and cost on the importer. The importer incur additional dummarege costs for trucks stay time at the port until the rail arrived at the dry port and truck to rail transfer of container was made by the port. As they indicate sometimes the export loaded trucks waited at the MDP for three days due to lack of space for export full containers in the dry port. Direct trucks to rail transfer of full export container were the factors of capacity that currently MDP is facing as indicated by the respondents. Therefore, the most important influencing factors of dry port operation space are the factor that contributing for Modjo inland port and terminal operation underperformance.

There were four main hinterland condition issues of Modjo dry ports and terminal that the respondents considered as influencing factors of Modjo inland port and terminal operation performance i.e. location of the dry port, its transport connectivity and the freight market supporting the dry port operations and the dry port sea port relationship. Accordingly, 72.8 percent of respondents were strongly agreed as the location has a great impact in influencing MDP and terminal operation performance. This means dry port located near to industrial zone or manufacturing area has a great advantage of having better performance compared to others. In addition 71.7 and 72.8 percent of respondents were strongly agreed as MDP road and rail connectivity direct to Djibouti sea port were important factors in influencing MDP and terminal operation performance. This shows dry port that directly connected to seaport through rail and road has better performance. On the other hand availability of Freight market and its Cooperation with Djibouti sea port 60.6 and 55.5 percent of respondents were strongly agreed as the availability of Freight market and its cooperation with Djibouti sea port has a great impact in influencing Modjo dry port and terminal operation performance. This indicates that hinterland condition sub factors location of dry port located near to industrial zone or manufacturing area and dry port that had direct transport connectivity through road and rail have advantage of better performance than dry port not located near to industrial zone and not have road and rail transport connectivity direct to seaport. The location of MDP near to industrial zone and capital city of Ethiopia Addis Ababa made MDP attractive and advantageous by supporting in provision of freight market. However, road and rail connectivity direct to seaport of Djibouti there was problem of space utilization via collaboration that indicate the relationship between MDP and Djibouti sea port and other dry port need to be improved to overcome the operation underperformance and increase the operation performance of MDP.

There were two main service feature issues of that the respondents considered as influencing factors of Modjo inland port and terminal operation performance i.e. administration and safety and security at dry port and availability of sufficient equipment for loading and unloading containers and bulk cargoes. Research such as that conducted by Roso and Lumsden (2009; 2010), and Ng and Cetin (2012) indicated that the provision of services provided by dry ports including customs clearance, container storage, maintenance and transfer between modes, and value-adding activities, influence their attractiveness to users. The descriptive statistics according to the respondents, 62.6 and 64.7 percent of respondents were strongly agreed as the availability of sufficient equipment for loading and unloading containers and bulk cargoes, and administration and safety and security at dry port has a great impact in influencing Modjo dry port and terminal operation performance. Currently due to expansion project that taking place at MDP the dry port does not have a fence and some of the respondent indicated that there is a great security problem in the dry port. Sometimes there was a problem of lost of container from the dry port. And if there is a terrorist attack there is no way that the dry ports get protected due to absence of fence. So, the security issues are the major important factor that MDP are facing.

Three main information sharing issues of that the respondents considered as influencing factors of Modjo inland port and terminal operation performance i.e. coordination for risk sharing, information of container flow forecasting and providing information for accurate decision making. Dry ports need to be able to possess sufficient and accurate information from other players within the container freight system for moving container freight efficiently and effectively information collaboration and coordination with other actors in the container seaport system are necessary. According to the respondents the factor are important in influencing MDP very and extremely agreed as coordination for risk sharing 54.5 percent, coordination for facility utilization 53.5 percent, providing information for accurate decision making 59.6 percent, and information of container flow forecasting 63.7 percent. Information sharing has been significantly identified as a key factor influencing dry port operations. The ability of MDP to provide accurate information to coordinate facility utilization and container flow forecasting

Therefore, in terms of the findings, there were six main government policy issues of that the respondents considered as influencing factors of Modjo inland port and terminal operation performance i.e. private ownership, public ownership, public-private investment, multimodal

transport infrastructure development policy, sea port land side policy, and provision of transport for short distance transport. MDP and multimodal transport are under public ownership so currently the private had no influencing factor even though short distance transport service provision or assigning truck and deciding price of short distance which means from MDP to customers warehouse were indicated by freight forwarders as the major influencing factor of Modjo dry port that highly contributing to under performance of operation. Generally, the response of the respondents on how important the government policy factor in influencing MDP the responded public ownership 51.5 percent, private ownership 33.5 percent, public-private investment 33.4 percent, provision of transport for short distance transport 47.4 percent, multimodal transport infrastructure development policy 64.7 percent, and seaport(land side policy) 49.5 percent.

An EFA was performed using a principle component analysis and varimax rotation. The minimum factor loading criteria was set to 0.50. The communality of the scale, which indicates the component of variances in each dimension, was show to ensure acceptable level of explanation. The result show all communalities were over 0.50. An important step involved weighted the overall significance of the correlation matrix through the Bartlett's Test of Sphericity which provides a measure of the statistical probability that the correlation matrix has significant correlation among some of its components. The results were significant Approx. Chi-Square (N=101)= 1966.332 ($p < 0.0001$) which indicates its suitability for factor analysis.

The Kaiser-Meyer-Olkin Measure of sampling adequacy (MSM) which indicates the appropriateness of the data for factor analysis was 0.900. In this regard data with MSA value above 0.500 are considered appropriate for factor analysis. Finally, the factor solution from this analysis yielded five factor for the scale which accounted for 67.98 percent of the variation in the data. Nonetheless, in this initial EFA, two items or variables (i.e. custom and inspection services of service features factor and multimodal transport infrastructure development policy of government policy factor) failed to load on any dimension significantly. Additionally, two items from hinterland condition factor (i.e. availability of freight market and its cooperation with Djibouti sea), two items from service features factor (i.e. its Rail- truck container transfer services and availability of sufficient equipment for loading and unloading), four items from capacity factor (i.e. availability of modern and sophisticated equipment , well maintained

equipment , adequate highways and wide roads , and adequate railway truck), two items from information sharing factor (i.e. coordination for risk sharing and coordination for facility utilization availability of freight market and its cooperation with Djibouti sea), and all sub-factors of government policy factor except public ownership loaded on to a factor other than its underlying factor. Therefore the 13(thirteen) items were removed from further analysis. The authors repeated the EFA including thirteen items. The result of this new analysis confirmed the five dimensional structure theoretically defined in the research (see table 4.7 rotated component matrix). The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.900. The five dimensions explained a total of 67.89 percent of the variance among the items in the study. The Bartlett's Test of Sphericity presented to be significant and all communalities were over the required value of 0.50. The five factors identified as a part of this EFA aligned with the theoretical proposition in this research. Factor one location near to industrial zone and manufacturing areas (of loading value 0.726), road connectivity direct to Djibouti sea port (of loading value 0.838), and rail connectivity direct to Djibouti sea(of loading value 0.785) port referring to hinterland condition factor. Factor two items provision of value adding services it provides to customers (of loading value 0.515) and administration and safety and security at dry port (of loading value 0.570) represents service features factor. Factor three sufficient space for full containers (of loading value 0.575), sufficient space for empty containers (of loading value 0.803), and space utilization via collaboration (of loading value 0.827) represents capacity factor. Factor four providing information for accurate decision making (of loading value 0.542) and information of container flow forecasting (of loading value 0.670) represents information sharing factor. Finally, the public ownership (of loading value 0.753) referring government policy factor.

# CHAPTER FIVE

# SUMMARY, CONCLUSSION AND RECOMMENDATIONS

## 5.1 Introduction

This chapter presents a brief summary of major findings and analysis under chapter four part of the study by dividing into three section under the heading of summary, conclusions and recommendations.

## 5.2 Summary of Findings

To attain the research objectives by answering basic research questions based on data analysis, discussion and interpretation of results the following summary of findings was made. The primary data was collected by survey questioner with close-ended and open-ended and interview from four stratum using convenience and judgmental sampling by applying stratified sampling technique from 101(98%) respondents out of 103 questioners distributed and 12(75%) interview participants from Modjo port and terminal, ECRA Modjo branch office, custom clearing and freight forwarders and ESLSE head office stratum. And the demographic profile of respondent was good enough scientifically to meet the objective of the study.

In the qualitative phase of these research the empirical finding from interview and open-ended survey questioner were provided. The participants of interview indicated the factors that influence dry port operations are availability of sufficient equipment, sufficient space, and coordination for facility utilization of capacity factor, location of dry and transportation connectivity of hinterland condition factor, stake holders that provide services of service of feature factor, coordination for risk sharing, and providing information for accurate decision making of information sharing factor and multimodal transport infrastructure development policy government of policy factor. Additionally, other factor that influence dry port operations were economic factors such as currency problem, financial capacity of the customers and expensive container deposit amount and well trained man power and internal and external war. The major factors currently affecting operation performance of Modjo were capacity sub factors of time of rail way arrival, export terminal unavailability, service feature sub factor of restrict and long customs procedure and security, information sharing sub factors of container taken by

customs, system (ICT and yard) and government policy sub factor of local transportation assignment for full out containers by the MDP.

The major contributing factor of MDP operation underperformance were capacity sub factors of lack of space for export container and shortage of container, hinterland condition sub factor of lack of terminal operating system and terminal location problem, service feature sub factor of customs inefficiency, lack of container maintenance and lack of safety and security, information sharing sub factor of failure of network system and lack of coordination among stakeholders, and government policy sub factor of absence of competition, relationship and provision of transport for short distance. Additionally, political and economic instability are the factor that contributing factor of MDP operation underperformance. The factors influencing operation performance contributed to under performance of Modjo dry port and terminal by decreasing warehouse and terminal efficiency and productivity, by increasing the service delivery time or average dwell time of services and decreasing quality of service, through affecting reliability and accuracy of services delivery efficiency and by decreasing international trade volume and destabilization of macroeconomic.

In the quantitative phase of this research the empirical finding from close-ended survey questioner and quantitative data were analyzed using descriptive and exploratory factor analysis. Accordingly, the results of major influencing factors of dry port operation that categorized into five namely: hinterland conditions, service features, capacity, information sharing and government policy factors. The service features factors influencing factors ranked the most influencing with grand mean score value of 3.59, the hinterland and capacity factors with the grand mean score of 3.57 found next influencer of MDP, and the information sharing with the mean grand score of 3.46 fourth and government policy with the 3.31 grand mean score fifth. Individually, sub factors sufficient space for full containers ranked first due to 3.86 with the mean score. Rail connectivity direct to Djibouti sea port with the mean of 3.85 the second, road connectivity direct to Djibouti sea port and sufficient space for empty containers with the mean of 3.78 and 3.77 ranked third and fourth, availability of sufficient equipment for loading and unloading containers and bulk cargoes with the mean of 3.73 ranked fifth.

On the contrary the five sub-factors that respondents agreed lowest rate of their importance in influencing MDP and terminal operation performance were public-private investment and private

ownership with the mean score of 3.05 last. Therefore, the result of the respondent found as most of respondent agreed service feature were the greatest major operation factor that influence MDP and terminal operation performance and government policy were the lowest factor that influence MDP and terminal operation performance. Regarding individually sub factors most of respondent agreed sufficient space for full containers ranked first that had highest importance in influencing MDP and terminal operation performance. The quantitative data of total container throughput fall in 2013E.C in the all dry port except Semara dry port. This indicate the economic and political factor were a major factor that affect dry port operation performance.

An EFA was performed using a principle component analysis and varimax rotation. The results show all communalities were over 0.50 with the overall significance of the correlation matrix through the Bartlett's Test of Sphericity of significant ($p < 0.0001$) the suitability for factor analysis. The Kaiser-Meyer-Olkin Measure of sampling adequacy of the data for factor analysis was 0.900. And the factor solution yielded five factor for the scale which accounted for 67.98 percent of the variation in the data. The initial EFA, two variables of service features and one variable of government policy factor failed to load on any dimension significantly. Additionally, two items from hinterland condition , two items of service features, four items of capacity factor, two items of information sharing and all sub-factors of government policy factor except public ownership loaded on to a factor other than its underlying factor and removed. The five factors identified as a part of this EFA aligned with the theoretical proposition in this research were location near to industrial zone and manufacturing areas, road and rail connectivity direct to Djibouti sea port referring to hinterland condition, provision of value adding services it provides to customers and administration and safety and security at dry port of service features, sufficient space for full and empty containers and space utilization via collaboration of capacity, providing information for accurate decision making and information of container flow forecasting of information sharing and public ownership of government policy factor.

### 5.3 Conclusion

Depending on the finding the following conclusions are made on influencing factors of inland dry port and terminal operation performance of our country in general and Modjo dry port and terminal operation performance study in particular.

The qualitative finding of the study indicated the factors that influence dry port operations were availability of sufficient equipment, sufficient space for full and empty containers, and coordination for facility utilization capacity factors. And the area of dry port and its transport connectivity of rail and road, custom and inspection services, health and other regulatory body like standardization, coordination to solve limitation (coordination for risk sharing), integrated system implementation (providing information for accurate decision making) and un availability of online system between ESLSE and customers, multimodal policy incentive, financial factors currency problem, capacity of the customers and expensive container deposit amount, well trained man power and war. Additionally, the major currently contributing factor of MDP operation under performance were availability of modern equipment, lack of export terminal, shortage of container, lack of terminal operating system and location problem inside the terminal of the port, customs inefficiency, lack of container maintenance of value adding services, and lack of safety and security, occasional failure of network system, lack of coordination among stakeholders, absence of competition and relationship with dry port and sea port or from private sector and local transport assigned by the dry port for short distance transport, internal conflict or war in our country and world, expensive container deposit amount and customers financial capacity problems. Therefore, the qualitative finding shows the major factor influencing inland port and terminal operation and contributed to underperformance Modjo dry port and terminal operation were capacity, information, economic, political, services features, hinterland and government factors sub-factors.

In addition the quantitative finding of the study indicates that the major influencing factors of dry port operation performance were the service features factors ranked first, capacity factors ranked second, third factors hinterland conditions, fourth information sharing factors and fifth government policy factors. Individually, sufficient space for full containers of capacity, rail and road connectivity direct to Djibouti sea port hinterland condition, availability of sufficient equipment for loading and unloading containers and bulk cargoes and administration and safety and security at dry port of service feature factors ranked from first to fifth. On the contrary the public-private investment and private ownership of government policy, location near to industrial zone and manufacturing areas of hinterland condition, sea port(Land side policy) of government policy and coordination for risk sharing of information sharing factor ranked at the lowest level of importance in influencing factors Modjo dry port and terminal operation performance.

The EFA identified five factors aligned with the theoretical proposition in this research i.e. location near to industrial zone and manufacturing areas, road and rail connectivity direct to Djibouti sea port referring to hinterland condition, provision of value adding services it provides to customers and administration and safety and security at dry port of service features, sufficient space for full and empty containers and space utilization via collaboration of capacity, providing information for accurate decision making and information of container flow forecasting of information sharing and public ownership of government policy factor. The quantitative data from secondary source indicated the fall of container throughput in all dry port in 2013E.C. This validates the major factor influencing inland port and terminal operation performance were capacity, information, economic, political, services features, hinterland and government factors sub-factors. And indicate the economic and political factor were a major factor that affect dry port operation performance and contributed to underperformance dry port and terminal operation performance.

## 5.4 Recommendation

Based on the study results, findings and conclusions, the following recommendations are made:-

- Modjo inland port had to work towards utilization of current available space for full containers to increase terminal storage capacity and terminal productivity.
- The inland port need to be assisted by digitalization technology digitalization by applying Terminal Operation System(TOS) to solve current location problem inside container terminal and warehouse to enhance terminal services reliability and efficiency by increasing productivity of port equipment.
- ESLSE need to solve public-private investment through improved and supported government policy to attain the benefit of these factors in the operation performance of the inland port and terminal operation performance.
- In order to develop and expand the Modjo dry port and terminal further economic stabilization and political instability the better strategy.
- Sharing international experience for implement strong management in the organization and training dry port workers and increase terminal productivity by developing the port to hub level by finishing expansion project timely and increase service quality.
- Develop system application of online system of information flow (like customs) between dry ports and customers.

## REFERENCES


Andersson, D. &Roso, V. 2016, Developing dry ports through the use of value-added services, Springer International Publishing, Switzerland.

Arvis, J.- F.et al.,2014. Connecting to Compete 2014: Trade logistics in the global economy: the

Beresford, A.K.C, Petit, S. Xu, Q. and Williams, S. (2012), "A study of dry port development in China," Journal of Maritime Economic and Logistics, Vol. 14, No.1.

Corbin, J., & Strauss, A. 2014, Basics of qualitative research: Techniques and procedures for developing grounded theory,SAGE publication, United Kingdom

Creswell, J. W. 2012, Educational Research: planning, conducting and evaluating quantitative and qualitative research, 4th edn, Pearson, Boston, MA.

FDT (2007) Feasibility study on the network operation of hinterland hubs (dry port concept) to improve and modernize ports' connections to the hinterland and to improve the networking, INLOC 2007

Fekadu M. Debela (2013). Logistics Practices in Ethiopia, Swedish University of Agricultural Sciences (SUAS)

Garnwa, P., Beresford, A. & Pettit, S. 2009, 'Dry ports: A comparative study of the UK and Nigeria.', in UNESCAP Transport and Communications Bulletin for Asia and the Pacific, United Nation, pp. 58-81.

Gena Alo, Mulugeta Endris and UmerAbdela (2020) Challenges and Prospects of Multimodal Transport System Provision and Operation in Ethiopia: The Case of Modjo Dry Port. Industrial Engineering Letters ISSN 2224-6096 (Paper) ISSN 2225-0581, Vol.10, No.2, 2020.

Haralambides, H. & Gujar, G. 2012, 'On balancing supply chain efficiency and environmental impacts: An ECO-DEA model applied to the dry port sector of India.', Maritime Economics and Logistics, vol. 14, no. 1, pp. 7-16.

Jarzemskis, A. &Vasiliauskas, V. 2007, 'Research on dry port concept as intermodal node', Journal of Transportation Economics, vol. 22, no. 3, pp. 207-213.

JaganJeevan, 2016,'The Role of Malaysian Dry Ports in the Container Seaport System', University of Tasmania, Kuala Lumpur, Malaysia.

Klink, H. A. (2000), "Optimisation of land access to sea ports," Proceedings of the land access to sea ports, European Conference of Ministers of Transport, pp. 10-11, Rotterdam.

Koh, Y.K., 2001, Optimal investment priority in container port development. Maritime Policy & Management, 28(2), pp 109 – 123

Kunaka, C. 2013, 'Dry ports and trade logistics in Africa', in Dry ports: A global perspective,, Ashgate Publishing Limited., Great Britain, pp. 83-109.

Munisamy, S. and Singh, G., 2011, Benchmarking the efficiency of Asian container ports. African Journal of Business Management, 5(4), pp 1397-1407,

Notteboom, T. & Rodrigue, J. P. 2009, 'Development of dry ports', in Inland terminals within North American and European supply chains. In East Asia Pacific,Transport and Communications Bulletin for Asia and the Pacific. United Nations, New York, pp. 1-39.

Ranjit Kumar (2011). Research Methodology, London, Sage Publications Ltd.,pp. 132

Ravitch, S. M. &Riggan, M. 2012, Reason and rigor: How conceptual frameworks guide research, SAGE publication, Los Angeles.

Rediet Bekele (2019), Determinants of Throughput Performance of Modjo Dry Port, Ethiopia, Journal of Business and Administrative Studies (2019), Vol. 11, No. 2,

Sileshi Alebachew (2020), 'Dry Port Logistics Performance of Modjo Dry Port', Addis Ababa University School of Commerce, Ethiopia.

Song, D. W. (2003),"Port co-operation in concept and practice," Journal of Maritime Policy and Management, Vol.30, No.1, pp. 29-44.

Suffian, F., Rosline, A. K. & Shah, M. R. 2013, The cabotage policy: Is it still relevant in Malaysia? , Springer, Selangor, Malaysia.

UNESCAP,(2006), "Logistics sector developments: planning models for enterprises and logistics clusters," Economic and social commission for Asia and the Pacific, United Nation, New York.

UNESCAP 2012, 'Development of an integrated transport and logistics system in ASEAN countries and the Pacific Subregion. Introduction to the development of dry ports in Asia ', in, United Nation, Bangkok, Thailand, pp. 321-344.

World Bank, (2017). Ethiopia Trade Logistics Project (P156590), Report No.: PIDISDSA19897.

Woxenius, J. and Bergqvist, R. (2010), "Hinterland transport by rail: comparing the Scandinavian conditions for maritime containers and semitrailers," Journal of Transport Geography, Vol. 16, pp. 64-78.

Woxenius, J., Roso, V. & Lumsden, K. 2004, 'The dry port concept–connecting seaports with their hinterland by rail',Proceedings of the ICLSP Conference Proceedings, 22-26 September 2004, Dalian, Department of Transportation and Logistics Chalmers University of Technology

WubeshetDemissie, 2018, Contribution of Multimodal Transport Operation System To Ethiopian Shipping and Logistics Services Enterprise, St. Marry University, Ethiopia.

YoditRegasaGudisa (2016), Dry Ports Service Quality in Ethiopia: The Case of Modjo and Kaliti Dry Ports and Terminals A- Comparative Study, Addis Ababa University School of Commerce, Ethiopia.

# Appendices

**Interview Questionnaire**

Factors Affecting Inland Port and Terminal Operations Performances: The Case of Modjo Inland Ports of ESLSE Information Sheet (For Interview).

This information sheet is for participants from MDP workers and managers, ESLSE dry port and shipping sector workers and managers, ECRA Modjo branch office workers and managers, and Custom Clearing and Freight Forwarding workers and managers.

Invitation:- You are invited to participate in a research project with the purpose of identifying and evaluating the major factors that affect inland port and terminal operation performance of Modjo Dry Port and how this factors contribute to operation underperformance of Modjo dry port to enhance its operation and further development. The study is will be conducted in partial fulfillment of a MBA Degree for Wubeshet Demissie under the Advisor of Dr. Matiwos Ensermu from the Department of Logistics and Supply Chain Management, Addis Ababa University School of Commerce.

PART A. Factors affect Modjo dry port and terminal operating performance.

1. What are the factors that influence dry port operations?
2. What is the major factors affecting operation performance of Modjo currently?
3. How these factors contribute to under performance of Modjo dry port and terminal?
4. Do you think this factors impacted overall transport cost and dwell time for customers?
5. What are the impact of Modjo dry port and terminal on Djibouti port competitiveness

**Questionnaire Survey Questions**

**Addis Ababa University College of Business and Economics School of Commerce**

Dear Respondents:- This questionnaire is designed to gather information on "Factors that Affect Inland Port and Terminal Operation Performance: The Case of Modjo Port and Terminal. The purpose of the study is to fulfill a thesis requirement for the Masters of Art in Logistics and Supply Chain Management. The information that you provide will be used only for the study purpose and will be kept strictly confidential. Finally, I would like to thank you in advance for your cooperation and dedication of your valuable time to fill this questioner.

Sincerely Yours,

Wubeshet Demissie

Contact Address: Phone No. 09-12807326 and E-mail: wubawube@gmail.com

Part I. Background Information

1. Gender: a) Male ☐ b) Female ☐

2. Age Group a) 20-30 ☐ b) 31-40 ☐ c) 41-50 ☐ e) Above 50 ☐

3. Education Background

A) High school or Certificate ☐ C) First Degree ☐ E) Above ☐

B) Diploma ☐ D) Second Degree ☐

4. Position and status in the organization

A) Officer Senior ☐ C) Coordinator ☐ E) Other ____

B) Senior Officer ☐ D) Manager ☐

5. Work experience in Organization?

A) 1-5 Years ☐ C) 11-15 Years ☐

B) 6-10 Years ☐ D) Above 15 Years ☐

6. Indicate nature of your organization?

A, MDP workers ☐ C, Custom clearing and freight forwarders workers ☐

B, ECRA workers ☐ D, ESLSE head office worker ☐

Part II Factors Affect Modjo Dry Port and Terminal Operation Performance.

Dear respondent: This section of the questionnaire addresses the Factors that Affect Inland Port and Terminal Operation of Modjo Dry port. Please read and understand how each factors affect the operation performance of port and terminal and indicate the extent of your agreement towards the statements by putting a tick mark (√) in the boxes representing your judgment. Note:- The rate indicate the factors level of influence on Modjo dry port and terminal operation performance. The number represents the level of influence as follows;

1= Important 2= Slightly Important. 3= moderately important 4= Very important

5= Extremely Important

| No | How important are the following factors in affecting its Modjo port and terminal operation performance | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| 1 | Its location near to industrial zone and manufacturing areas | | | | | |
| 2 | Its Road connectivity direct to Djibouti sea port | | | | | |
| 3 | Its Rail connectivity direct to Djibouti sea port | | | | | |
| 4 | Availability of Freight market | | | | | |
| 5 | Its Cooperation with Djibouti sea port | | | | | |
| 6 | Provision of value adding services it provides to customers | | | | | |
| 7 | Its Rail- truck container transfer services | | | | | |
| 8 | Custom and inspection services | | | | | |
| 9 | Availability of sufficient equipment for loading and unloading containers and bulk cargoes | | | | | |
| 10 | Availability of Modern and sophisticated equipment | | | | | |
| 11 | Well maintained equipment | | | | | |
| 12 | Adequate highways and wide roads | | | | | |
| 13 | Adequate railway truck | | | | | |
| 14 | Sufficient space for full containers | | | | | |
| 15 | Sufficient space for empty containers | | | | | |
| 16 | Space utilization via collaboration | | | | | |
| 17 | Coordination for risk sharing | | | | | |
| 18 | Coordination for facility utilization | | | | | |
| 19 | Providing information for accurate decision making | | | | | |
| 20 | Information of container flow forecasting | | | | | |
| 21 | Public ownership | | | | | |
| 22 | Private ownership | | | | | |
| 23 | Public-private investment | | | | | |
| 24 | Provision of transport for short distance transport | | | | | |
| 25 | Multimodal transport infrastructure development policy | | | | | |
| 26 | Sea port(Land side policy) | | | | | |
| 27 | Administration and safety and security at dry port | | | | | |

Part III. Factors contribution to underperformance and strategies to enhance operation performance and further development of Modjo dry port and terminal.

1. What factors do you think contribute greatly to the underperformance of Modjo inland port and terminal operation?----------
   ----------
2. What are other factors that not included in the above factor that affect operation of modjo dry port and terminal performance? If any----------
   ----------
3. How do you think the dry port overcome this factors that contribute to operation underperformance in dry port and terminal operation?.....

…….

4. What are the strategies for enhancing Modjo inland port operations and further development?
   ……
   ……