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DEVELOPING A DRY PORT TO SPATIALLY INCREASE AND DECONGEST BANJUL PORT

By

Dawda Colley

The Gambia

A dissertation submitted to the World Maritime University in partial fulfilment of the requirement for the award of the degree of

MASTER OF SCIENCE

In

MARITIME AFFAIRS

(PORT MANAGEMENT)

2019
Declaration

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

(Signature):

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Abstract

Dissertation Title: DEVELOPING A DRY PORT TO SPATIALLY INCREASE AND DECONGEST BANJUL PORT

Degree: Master of Science

The motive of this research work is to assess how developing a dry port in the Gambia could be used to decongest Banjul Port contrary to the buying of private properties for port capacity expansion. As the port is located in the capital City of Banjul, its spatial expansion is constraint as a result of close proximity to residential and other public facilities such as schools, market and a football park. Despite this constraint, the port has experience a significant increase in container traffic, resulting to unabated congestion levels at the container yards. This congestion has created bottlenecks such as increase waiting and turnaround times of ships coupled with increase container dwelling time in port. These inefficiencies could make Banjul Port very unattractive to shipping lines and cargo owners which may result to loss of market share to competing ports sharing the same hinterland. The Board of Directors and Management of the port are in negotiation with the City Council and private property owners to again buy the properties adjacent to the port for another capacity expansion project. This port expansion strategy is not financially, socially, environmentally and economically viable in the medium and long term.

Given the above mentioned circumstances, the dry port concept is introduced as a more viable alternative for Banjul Port expansion. The reviewed literatures on the subject indicates that dry port are developed for the purpose of extending seaport activities into the hinterland thereby relieving the port from the effects of congestion, thus improve efficiency and productivity. The seaport and dry port are connected by high capacity intermodal transport systems such as rail, inland waterways/river and road transport. Contemporary studies claim that dry ports are an indispensable part of an integrated transport logistics system and provide many benefits.

The development and functionality of a dry port involves many stakeholders including local Government/City Council, Other Government agencies, shipping lines, carriers, freight forwarders, cargo owners, haulage service providers and local communities. For this reason, the researcher after analyzing the level of congestion at Banjul Port, designed a questionnaire targeting these stakeholders to gauge their opinion on the prospect of developing a dry port in the hinterland of the Gambia for viable and sustainable port expansion.

KEYWORDS: Dry port, port capacity, expansion, congestion, ships waiting time, turnaround time, container dwell time, viable, sustainable and intermodal transport.
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List of Abbreviations

GBoS                 Gambia Bureau of Statistics
TEUs                 Twenty Equivalent Units
ADB                  African Development Bank
GPA                  Gambia Ports Authority
UNCTAD              United Nation Conference on Trade and Development
Ro-Ro                Roll on Roll off Ship
Ro-Pax               Roll on and Passenger
KPIs                 Key Performance Indicators
MIS                  Management Information System
IAP                  Incident Action Plan Software
AGV                  Automated Guided Vehicle
BOT                  Build Operate and Transfer
BOOT                 Build Own Operate and Transfer
BOO                  Build Own and Operate
MADM                 Multiple Attributes Decision Making
LAMBIT              Location Analysis Model for Belgian Intermodal Terminal
SMART               Simple Multi Attribute Rating Techniques
FCLs                 Full Container Load
MTs                  Empty Containers
GPA                  Gambia Ports Authority
Chapter 1: Introduction

This section introduces the research work; highlighting the motivation, research problem and objectives. The research questions, scope and layout of work are also discussed herein.

1.0 Background of research

The purpose of this research is to gauge how developing a dry port in the Gambia could be used as a means to spatially expand Banjul port, generate enough space for container staking and consequently decongest the port, improve its productivity and competitiveness. Banjul Port is a public service port located in Banjul, the capital city of the Gambia. The port is in close proximity to residential properties and public facilities such as schools, football park and the city’s main market. Over the years, the port has grown in significance to the economy of the country, handling over 85% of goods traded (import and export); GPA Management report & GBoS annual report, 2014. Similarly, the port shares overlapping hinterland with ports such as the port of Dakar, Senegal, the port of Conakry, Guinea and the port of Bissau; ADB Group report, 2016 and (Casal, De Nicola, Toure Ibrahima, De Kleine & Marchat; World Bank, 2015). River Gambia was predominantly used in mid 1980s to 1990 to access the inland terminals developed by the Gambian Government in 1984, thus connecting the port and its hinterland. Road networks were later developed to augment river transport thereby creating multi-modal networks; Ajijio, Kiziti Kabarguki & Mwila; ADB Group Report, 2016.

However, due to dilapidation of the inland terminals, river transport has been weakened in recent past, with road networks now the only means of link to and from the port. The location of the port impedes its need for spatial expansion to accommodate growth in cargo traffic. Because of this constraint, the port experiences perennial congestion at its terminals. To alleviate this constraint, the port’s Management bought thirty-five (35) private properties adjacent to the port in 2011 for spatial expansion.

Prior to this development, the port witnessed a shift in the mode of cargo handled from break-bulk to containerization. This shift necessitated an increase in container storage space to accommodate present and future cargo traffic growth. During the last decade (2009 to 2018), the port has realized an increase in containerized cargo from 54,116 TEUs in 2009 to 130,492 TEUs in 2018.
The figure below illustrates container traffic handled at Banjul port in the last decade.

![Container traffic (in TEUs)](image)

**Figure 1: Container traffic handled at Banjul Port in 2009 to 2018 (in metric tonnes)**

*Source: GPA cargo traffic reports; 2009 to 2018*

From the above figure, cyclicality can be observed with contractions in only 2013 and 2015; otherwise there was a steady rise in the other years.

The acquired properties were developed into a new container yard and inaugurated in 2015. However, after 2015, container traffic surged almost saturating the handling capacity of the container yards. This engendered congestion at the container yards and other areas within the port’s vicinity.

Due to its location, the spatial expansion of Banjul port to accommodate present and future cargo traffic growth is deemed non-feasible, financially, socially, economically and environmentally. In order to address this situation, the Researcher believes there is need for developing a dry port.

The development of dry ports globally has witnessed a steady rise since its emergence in the late 1970s and early 1980s. Dry ports are sometimes used interchangeably with terminologies like inland terminals, freight village, and inland container depot (UNCTAD, 1991 and Kim & Sachish, 1986). However, the term dry port will be used throughout this research work to maintain consistence.
The dry port concept revolves around three main facets as shown in the figure below.

![Diagram of dry port concept]

**Figure 2: The three facets of dry ports**

**Sources: Authors; Adopted from Nguyen and Notteboom, 2018**

These facets include a terminal facility which is accessible and used by trains, barges and trucks to load and unload cargoes. The terminal also serves a place where cargoes are temporarily stacked and necessary customs clearance conducted for further delivery to consignees.

The strong links such as rail, inland waterway and road serves as means to connect the seaport and dry port. Cargoes to and from seaport are transported using these links. Similarly, the dry port offers other value added services to attract more cargo, extend seaport activities inland and equally improve seaport performance and competitiveness (UNCTAD, 1991).

### 1.1 Research objectives

The research aims to fulfill the following objectives

- Conduct a quantitative and qualitative research that is inclusive of port stakeholders’ perspective on dry port development in the Gambia.
- To evaluate the short and long term benefits port stakeholders’ will drive from such project.
- To present the results and recommendations of this research to the management of Gambia Ports Authority for consideration and future decision making.
1.1.1 Research Questions
The main focus of this research is to gauge how dry port could be developed to decongest Banjul Port and equally extend the activities of the port into the hinterland. The research questions are therefore as follows:

I. How developing a dry port could be used to spatially expand Banjul Ports, extend its activities into the hinterland and thus decongest the port?

II. How the development of such project could contribute in reviving river transport in the Gambia?

III. What effect would such project have on port performance and competitiveness in the sub-region?

1.2.0 Purpose of research
This research work aims to identify how a dry port could be developed in the Gambia to spatially expand Banjul Port, extend its activities inland and also serve as a means to decongest the Port. The Board and Management of Banjul Port are presently engaged in negotiations with Banjul City council and property owners to buy properties adjacent to the port; again for increase storage capacity. The increase in container traffic registered in recent times is negatively impacting on port’s efficiency. This is indicative of the increase in ships waiting and turnaround times and container dwelling time in the Port. Banjul Port container traffic in TEUs has grown by 114% from 2009 to 2018; (54,166 TEUs in 2009 to 130,492 TEUs in 2018).

The figure below illustrates container traffic in TUEs handled at Banjul Port from 2009 to 2018:

![Graph](image)

*Figure 3: Container TEUs handled at Banjul Port in 2009 to 2018*

*Source: GPA cargo traffic reports; 2009 to 2018*
The above figure, indicates a fluctuating trend from 2009 to 2015 but maintained an upward trend onwards to 2018. In cognizant of container traffic growth in 2009 and 2010 and future forecast, a new container yard was built and inaugurated to extend and augment container storage capacity from 43,800 square meters to 59,000 square meters (GPA Estate Dept. records 2011). The increase in container storage capacity by 15,200 square meters, temporarily eased congestion, improved ships operating and turnaround times and terminals efficiency. This also translated to an increase in container traffic from 83,809 TEUs in 2015 when the new container terminal was inaugurated in 2015 to 130,492 TEUs in 2018; representing 56% rise.

The aforementioned rise of container traffic poses challenges to the port considering its physical constraints as a result of its location and close proximity to residential areas, schools and the city’s main market. Another problem faced by the port and its users is the lack of enough connectivity to and from the port in recent years. Up till late 1980s and early 1990s, River Gambia and road networks served as the transport connectivity modes to and from the port. River transport to the hinterland has been abandon over the years with the port presently connected to the foreland and hinterland by mainly road and unreliable Ro-Pax ferry services. These two transportation system are constraint by challenges such as road congestion and frequent breakdown respectively, thus hindering the timely and efficient delivery of cargoes to consignees and final consumers.

To address this challenges, improve Banjul ports efficiency and competitiveness, there is need for a paradigm shift from buying properties adjacent to the port to developing a dry port in the hinterland of the country. This will enable the revival of river transport, creation of employment opportunities and most importantly create enough space to accommodate present and future container traffic growth.

1.2.1 Scope of work

The research aims to illustrate the applicability of dry port in the Gambia in order to expand Banjul Port storage capacity. Developing a dry port is a strategic decision involving many stakeholders with divergent interest.
The research focuses on developing a dry port in the hinterland, using river and road transport networks to connect the port and its hinterland. The researcher perceives that, developing such a project will help decongest the port and improve its productivity and competitiveness.

Conversely, the researcher does not identify any specific location in the hinterland for the establishment of such a project because this is beyond the scope of this research. As a result, several locations will be highlighted based on multiply selection criteria from various literatures on dry port location. This shall serve as a reference when the recommendations are put forth to the Board of Directors and Management of Banjul Port.

1.3.0 Research structure
The research work is divided into six chapters as detailed below:

Chapter 1 entails the background of research, research objectives and questions, purpose and structure of research.

Chapter 2 reviews literature on the evolution of dry port concept, its uses and contribution to seaport operation and efficiency.

Chapter 3 provides the methodology used to gather data and information for the research purpose, highlighting quantitative data used including, container traffic, ship calls, ship time at anchorage, berth and turnaround times. Likewise, a questionnaire was sent to port stakeholders like shipping lines, freight forwarders, transporters, clearing agents and others. This was aim to gauge their opinions on the current congestion experience at the port and how it can be curtailed through the implementation of a dry port.

Chapter 4 categories dry ports into three; distant, mid and close range, stakeholders, policy formulation and conceptual framework in determining the location of dry ports. Also, the financing and implementation models of dry port are discussed herein.

Chapter 5 contains the interpretation of collated primary data responses generated from questionnaires and the analyses of Banjul Port traffic data such as ship turnaround time, berth occupancy and container dwell time.

Chapter 6 provides a conclusion by summarizing the research and explaining the findings from the analyzed primary data and the reviewed literatures. Afterwards, recommendations and the benefits
Banjul Port will drive from the implementation of such a project are discussed. Further to that, the research limitations are also highlighted.
Chapter 2: Literature review

2.0 Introduction

In this chapter, the researcher extensively reviews scholarly articles on dry ports to establish why and how they are being developed. This has enabled the researcher to identify gaps in the literature as ports have evolved over the last decades from 2nd generation ports primarily providing traditional ship and shore cargo handling services to 4th generation ports which are integrated into the global supply chain. This integration creates a one stop shop; where a wider range of services are provided within the confines of the port. Again, this has accorded the researcher the opportunity to also contribute on the topic from the standpoint of Banjul Port considering its challenges. Similarly, this has also enabled the researcher to identify crucial elements for a successful dry port implementation in the Gambia.

2.1.0 Review of dry port Literatures

The development of dry ports globally is driven by increased worldwide trade and globalization, continuous changes in international freight transport and outreach, the regionalization of cargo operations in pursuit of greater port efficiency, hinterland outreach coupled with deregulation of port governance systems to allow more private participation in port operations as reflected in regulatory, managerial and technological innovations within the sector in recent times (Cullinane, Bergqvist, Wilmsmeier, 2012). In addition to the aforementioned, many countries, port administrators and operators felt the need to reorient the marketing of port services to access the hinterlands through multimodal transport and thus consolidate their strategic position within the inherently competitive supply chains (Robinson, 2002).

Furthermore, the traditional location or close proximity of seaports to suburban/urban areas or cities impede their spatial development and requirement for sufficient container storage space. Also, Bergqvist, Wilmsmeier & Cullinane 2012, argue that as more freight transport and logistics functions are integrated into the global supply chain, the need for container trade and liner shipping to move inland from seaport becomes more necessary. Alluding further, they claim that, the increased sizes of ships over the last decades have put more pressure on ports to handle larger volumes of load units during short periods of time. To overcome this multifaceted problems
including capacity expansion, environmental considerations and community restrictions, the emergence and development of dry ports became more relevant (Cullinane and Khanna 1999).

As pointed out by the above mentioned scholars like Cullinane, Bergqvist, Wilmsmeier, Robinson and Khanna, I agree that the need for dry port implementation in many regions and countries around the World has been spurred by factors such as globalization, continuous containerization of cargo, increased vessel sizes, regionalization of trade and hinterland accessibility. Notwithstanding, I am also of the opinion that the most compelling need for dry port development is the lack of enough expansion capacity seaports are faced with due to their location in cities. Globally, most ports are located within cities and the expansion of private residents, city centers, recreational areas have compressed seaports abilities to expand. This complicated port-city relationship, therefore created a window of opportunity for port stakeholder and policy makers to search for alternative options to spatially increase port capacities, thereby implementing dry ports (Felicio, Caldeirinha & Dionisio, 2014).

As originally conceived and defined by UNCTAD 1982, a dry port is an inland terminal to and from which shipping lines could issue their bills of lading for import and exports of cargoes. In both theory and practice, however, the concept has evolved and so does the definition. UNCTAD, 1991; defines a dry port as a common user facility with Public Authority status, equipped with fixed installation and offering services for handling and temporary storage of all kind of goods including containers, located inland but linked directly to seaport through multimodal transport networks such as roads, rails or inland waterways. Similarly, Roso et al (2009) in his definition of dry port mentioned a range of services offered by dry ports including customs clearance, storage facility, cargo consolidation site, cargo handling for different transport modes, depot function, container maintenance and repair and other value added services.

Nguyen and Notteboom (2016) explained that a dry port is an inland terminal connected to a seaport by means of high capacity and frequent transport services through the use of rail, road or inland waterways. Also, a well-organized and coordinated dry port within a supply chain setting could serve as an extension of seaports activities inland to facilitate the movement of cargo between seaports and the hinterland (Beresford, Pettit, Xu and Williams, 2012).

In addition, Nguyen and Notteboom (2016) debated that, the motives of developing a dry port differs in advance economies such as Europe and North America compared to developing
economies in Africa and South-east Asia. In develop economies, the purpose of developing dry port is to solve problems of limited capacity, natural constraints and externalities at seaports and further improve hinterland accessibility of particularly import cargoes. Conversely, in developing economies, dry ports are naturally land-driven, established for consolidating export cargoes from regional economic zones and forwarding them to gateway seaports thus improve and accelerate the development of inland logistics and efficiency (Veenstra, Zuidwijk, Asperen, 2011).

Van der Horst and Van der Lugt (2011) deliberated that, dry port development creates hinterland accessibility and thus serves as a strategic tool for seaport competitiveness amidst growing competition between seaports. Efficient hinterland accessibility and connectivity afford seaport diverse transport chains (Marlow, Paixao and Casaca, 2003). Other qualities include transport companies and operators tend to benefit and offer good transport solutions to their clients in a cost effective and profitable manner (Baird, 2006). Again hinterland accessibility enables shippers to access the inland market using multimodal means, which in turn lowers transport cost and makes trade cheaper (Roso et al 2009).

Cullinane and Wilmsmeier (2011) contested that dry port can be developed to elongate the life cycle of a seaport. In their exposition, ports located in cities are likened to products and therefore go through different stages of development including introduction, growth, maturity and decline phases. When a ports reaches maturity phase, its ability to spatially expand is constrained due to close proximity with the city center and residential areas. At this point, the supply of port capacity becomes fixed, since neither further expansion of the physical port area nor any other efficiency gains are possible or financially feasible. As a result of this, port congestion, loss of market-share to competing ports with overlapping hinterlands becomes inevitable. This also leads to longer turnaround time of vessels, low ship and berth productivity and decline cargo volume in the long-run.

To mitigate these negative consequences, implementing a dry port to elongate the product life cycle of a seaport and thus defer its decline phase becomes prudent (Cullinane and Wilmsmeier, 2011).

The analogy and exposition of Cullinane and Wilmsmeier does apply to the Banjul Port. The location of the port has made it practically impossible to spatially expand due to the port’s close proximity to private and public properties, making the port prone to these negative effects.
Li, Hu and Shi, 2011, discussed that apart from relieving seaport congestion, improve inland access, the implementation of dry port also improves seaport competitiveness by attracting more ship calls. Roso 2007, contested from an environmental perspective that a city port that has implemented a dry port, reduces carbon-dioxide emission by 25% compared to the city ports that have not implemented a dry port. Likewise, the implementation of dry port as an intermodal transport system reduces transport cost through the economies of scale effect (Wee, Sheng and Lee, 2017). The transportation of cargo from road to rail or inland waterway would not only reduce transportation cost, but also cut down the pollution, noise level and road accidents (Roso 2007).

As subsystems to global supply chain, seaports provide crucial links in the flow of cargo and related information by rendering lean and agile value added services which are flexible and highly integrated with intermodal terminals or dry ports (Jeevan, Chen and Lee, 2015). Providing lean and agile value added services, seaports and dry ports are able to reduce the complexities of international trade by using information and technology to create a synergy, thus improve the interaction of various stakeholders involved in international, regional and domestic trade.

From the reviewed scholarly work, the researcher exposition that the development of dry ports can serve as a means of extending seaport gates and activities inland, relieve seaport from space constraints and congestion, improve seaport competitiveness through the use of multi-modal transport system. For dry ports to achieve these intended purposes, their integration with seaport and more essentially the global supply chain is of primary importance. This, the researcher believes will reduce the complexities of cargo flow between seaports and dry ports therefore create a more seamless and agile system.

For this integration process to be in place, there is need for not only multi-modal transport system but also information communication system, value-added services, supply chain integration practices and performance measurement.

In conclusion, for successful implementation of dry port in the Gambia, components of seaport-dry port integration need to be assess and created to complement the multi-modal transport system. Through this, Banjul port could be spatially extended into the hinterland in a more efficient and effective manner.
Seaport-dry port integration system is illustrated in a hierarchical flow diagram as show below.

Figure 4: Components of seaport-dry port integration

Sources: Authors, adopted from Song & Panayides, 2008

The above mentioned seaport-dry port integration components are explained as follows:

**Information communication system:** Data and information sharing between the various stakeholders in the seaport-dry port system such as freight forwarders, terminal operators, transporters and customs underpins the seamless flow of cargo from seaport to dry port and vice-versa. Establishing information communication system between these stakeholders will also harnesses relationship amongst actors and thus enable more data and information accuracy, timeliness, adequacy and credibility.

**Value added services:** The implementation of dry port is not for only consolidation and storage of cargoes but it can also include other value added services such as warehousing, customs clearance, logistics or distribution parks, processing areas and container marshalling area. These value added services can help improve the efficiency and competitiveness of the main seaport and generate more revenue for terminal operators.
Supply chain integration practices: This include the creation of long term relationships between stakeholders including shipping lines, freight forwarders, transport service providers in rendering services and connecting the seaport and dry.

Performance measurement: “If you cannot measure, you cannot control” (Peter Drucker). In order to measure the level of seaport-dry port integration, there is need for measuring operational, services, financial and environmental aspects of the port-dry port system.

The figure below depicts the components, facility/service and how to measure their performance for effective and efficient seaport-dry port integration.

Figure 5: Components, facilities and measures for seaport-dry port integration system

Sources: Compiled by the Author
The above components, facilities/services and measures serve as the basis for seaport-dry port integration and effective flow of cargo and information.
Chapter 3: Research Methodology

This section discusses techniques or methodology used in the research including both quantitative and qualitative. The section also highlights the analytical approach used and the research etiquettes.

Banjul Port statistics data from 2013 to 2018 is used to analyze how ship calls and container traffic over the years impacted on the port capacity in terms of storage space and productivity. This is the basis on which the level of congestion at the port would be measured using port KPIs such as average ship waiting/anchorage time, average ship time at berth, average turnaround time and average container dwell time.

A questionnaire is also used as a primary data collection tool to generate information from port users including shipping lines, freight forwarders, transport operators on challenges port congestion poses to their organizations or businesses.

3.0 Data collection methods

The data collated for this research is of two; quantitative and qualitative. Under the quantitative data, details of ship traffic were collected from Harbors Department, Banjul Port to analyze the time ships spent at anchorage waiting for berth slot. Again, the time ships stay at terminal/berth for discharging and loading is also obtained to measure labor productivity in hours required for cargo discharging and loading. Most importantly, the average turnaround time of ships is also measured, as this is one of the most important KPIs in measuring port performance and more so the level of congestion.

In addition, container traffic in TEUs handled at the port in the past decade (2009 to 2018) is also analyzed to determine the growth rate of the port and what implications does this growth denote to the port in terms of overall port productivity and performance.

In the same vein, a questionnaire was developed by the researcher, targeting multiple port stakeholders as respondents. Respondents were asked on issues ranging from the physical attributes of the port such as berth facilities, foreland and hinterland connectivity or intermodal transport systems. Furthermore, availability of organizational attributes such as integrated information system, coordination and supervision of port services and cargo handling facilities such as warehouses, container scanning machines and enough open storage capacity for container
staking were also examined. These questions gave the researcher an insight into the perspective of port stakeholders and how the above mentioned attributes of the port affects their businesses. Likewise, secondary data sources such as journal articles, books, conference papers, business reports and other secondary sources were also used to argument the primary data acquired by the researcher. The secondary data broadens the researcher perspective on the research topic and more so made it possible for the researcher to conduct the research in the shortest time possible.

![Data collection methods](image)

**Figure 6: Summary of data collection methods employed by researcher**

*Sources: complied by Author*

### 3.1.0 Respondents

Organizations or companies directly involved in port operations were chosen as respondents for this study. This reason is, the notion of implementing a dry port to decongest Banjul Port and extend its activities inland is new approach the researcher wants the Management of Banjul Port to use contrary to buying private properties to spatially expand the port.

In light of this, the researcher deems it fit to first gauge the opinion of organizations, companies and individuals directly involve or affected by port operations. The respondents include shipping
lines, freight forwarders, local residents, haulage truck owners, clearing agents, port staff and major importers and exporters.

The researcher believes that the targeted number of respondents will suffice in carrying out a thorough preliminary research for dry port implementation. In total, forty respondents were targeted, of which thirty-three completed the questionnaire and seven did not. As part of the etiquettes of research, a consent form was also sent out to the targeted respondents, seeking their consent to participate in completing the questionnaires; (See Appendix 1).

3.1.1 Questionnaire design

The questionnaire is divided into five sections; that is section A to E (see Appendix 2). Section A gathers background information of respondents including their line of business and level of activities.

Section B is divided into two sub-section namely; the physical and organizational attributes. However, the organizational attribute is also further sub-divided into cargo handling and cargo storage organization and coordination at Banjul Port.

Under the physical attributes, the state of conditions such as the access channel into the port, berthing and other infrastructure such as foreland and hinterland connectivity conditions were asked or assessed. Sub-section two, looks at the organizational attributes in terms of management information system (MIS), level of coordination, supervision, control and monitoring of port services. Furthermore, questions on quantity and quality of services such as warehousing, cargo scanning machine and container storage capacity of the port were asked and assess to determine the level and quality of services being provided to port users.

Similarly, section C and D provide a five-point scale to measure respondent’s degree of agreement or otherwise on the operations and perennial congestion issues faced by port. The five-point scale include degree of agreement or otherwise such as “Disagree, strongly disagree, Neutral, Agree and Strongly agree”. The questions asked on this section include far-reaching issues that port users are faced with including bureaucratic procedure for cargo clearing, the implementation of dry port to decongest Banjul Port, obsolete and insufficient cargo scanning machines and insufficient cargo handling equipment.
Finally, in section E the researcher seeks to have an insight of respondents’ perception on the future development of Banjul port; that is in the next five, ten and fifteen years. The question being asked in this section summarizes the questionnaire and gauges respondent’s opinion on the need for dry port development in the Gambia.

3.2.0 Analysis method

After obtaining the thirty-three completed questionnaires, answers generated were grouped into three broad attributes. The categories include physical and organization attributes of the port and the need for dry port development. The physical and organization attributes were further subdivided as follows:

i. Physical attributes such as

- Berth facilities
- Container yard storage facilities
- Intermodal connectivity systems
- Warehousing facilities within the port premises

ii. Organization attributes specifically for

- Management information system
- Supervision, control and monitoring of port services
- Quantity and quality of handling equipment
- Lack of segregation of container yards as per shipping line

In conclusion, the need for dry port development was put forward to respondents. In analyzing collated information generated, Microsoft Excel is mainly used as the researcher is more accustom and comfortable with this analysis tool as compared to IPA and other analysis tools.

After obtaining approval of the questionnaire from University’s Research Ethics Committee, the questionnaire was sent to my colleagues at Banjul Port for distribution to the targeted respondents.
Soft copies of the completed questionnaires were sent to me via email for analysis and interpretation.

3.2.1 Research etiquettes
This research involves human participation and thus most conform to high standard research etiquettes. During the course of distributing the questionnaires, targeted respondents were assured anonymity; in person and their organizations or businesses. Respondents anonymity is maintained throughout this research work. In addition, information or data provided by respondents will be strictly used for this research purpose only and disposed thereafter.
Chapter 4: Introduction to dry port implementation

This chapter discusses dry port implementation, types in terms of distance from seaport, stakeholders and policy formulation for successful dry port implementation. Also a conceptual framework for dry port implementation is discussed which could be as a reference for such development in the Gambia.

4.0 Dry port implementation

Even though the design and layout of dry ports varies from region to region or country to country, the principal factors such as container traffic volume and pattern, special trade requirements and local conditions are indispensable factors to be considered when implementing dry ports (Beresford and Dubey, 1990). Generally, irrespective of the region or country, dry port development normally constitutes infrastructures and superstructures like terminal, yard, warehouses, container marshalling area, office building and multimodal connectivity modes like rail, road and inland waterways (Beresford and Dubey, 1990, UNCTAD, 1991 and Roso and Woxenius, 2006). Beresford and Dubey (1990) discussed that before commencing the design and layout of a dry port, the following must be determined:

- The type of facilities that the dry port users will require
- Container traffic forecast; preferably for a ten years’ period
- Modes of transport and network capacities
- Estimated traffic flows between centers of production/consumption and the seaport and dry port
- Scope for future expansion and development
- Existence or inducement of auxiliary transport and financial services in the vicinity of the dry port
- Transport infrastructure in the vicinity of the selected site for dry port development
- The actual functions of the dry port, such as full and empty container storage, customs clearance, road haulage, shunting and other value added services.
The implementation of dry port involves huge sunk, operational and maintenance costs. These costs may be funded by the public sector, the private sector or a combination of the two through a PPP arrangement (World Bank Port Reform Toolkit 2003).

Dry ports operation and funding in the 21st century represent a combination of public and private goods. Public goods include, those goods that are inherently no-divisible, and non-consumable such as access channel, lighthouses, port basins and public land and infrastructure. On the other hand, private goods may involve port superstructure such as vessels and cargo handling equipment like gantry cranes, container terminals, AGVs, and warehouses. Each funding model has its own merits and demerits. A publicly owned dry port gives greater security to the actors involved in the operations since chances for malpractice or unreasonable tariffs are minimized. In contrast privately owned dry ports can be more flexible to trade, such as changes in tariff structure or, for example, changes in daily operations are needed (Roso and Woxenius, 2006).

According to World bank port reform toolkit (2003), investment in ports, terminals/dry ports depends on the governance model adopted; that is whether the port is a landlord port, tool port or public service port.

The table below shows the governance and investment model in various types of port systems.

<table>
<thead>
<tr>
<th>Port model</th>
<th>Basic infrastructure</th>
<th>terminal infrastructure</th>
<th>Superstructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landlord model</td>
<td>Government</td>
<td>public/private</td>
<td>Government/public/private</td>
</tr>
<tr>
<td>Tool port model</td>
<td>Government</td>
<td>Government/public</td>
<td>public/private</td>
</tr>
<tr>
<td>Public service model</td>
<td>Government</td>
<td>Government</td>
<td>Government</td>
</tr>
</tbody>
</table>

*Table 1: Investment models for port and terminals*

*Sources: World Bank Port Reform Toolkit (2003)*
The above table illustrates the investment models in ports, terminals and dry ports alike. Due to lack of efficiency in public service ports, private participation in ports operations is encourage to enable competition and better service delivery.

4.1.0 Types of dry ports

Roso et al (2009) categorize dry ports into distant, midrange and close range, based on their functionality and location from seaports. The benefits derived from each dry port location is as follows;

I. Distant dry port

A distant dry port amongst other benefits, extends the gates of the seaport deep into the hinterland, serving as an interface between seaport and shipping lines. Another benefit includes the modal shift from road to rail or inland waterways which reduce congestion and noise levels at seaport gates and surroundings as well as other external environmental effects along the route (Beresford and Dubey, 1990).

The figure below shows the location of a distant dry port from a seaport.

Figure 7: Distant dry port

Sources: Authors; Adopted from Roso & Woxenius, 2006
The main reason for implementing a distant dry port is to serve as a means of using rail or barge transport geared towards mainly reducing transportation cost (Roso and Woxenius 2006).

II. Mid-range dry port

As the name implies, a midrange dry port is located within a distance from the seaport and generally serves as a buffer, thus relieving the seaport stacking areas from the effects of congestion (Tsilingris and Laguardia, 2007). Its relative short distance also enables the consolidation of more cargo volumes at a single point for onward transportation by rail, barges or road to final destination or port for export (Tsilingris and Laguardia, 2007). The figure below depicts a mid-range dry port location.

Figure 8: Mid-range dry port

Sources: Authors; Adopted from Roso & Woxenius, 2006
III. Close range dry port

The existence of a close dry port in the immediate hinterland of the seaport increases seaport’s terminal capacity, productivity and improved turnaround time of ships. This enables the alleviation of seaport congestion, therefore stimulating more ship calls, increase traffic/throughput and terminal efficiency (Roso et al, 2007).

The figure below illustrates the location of a close range dry port in the hinterland of a seaport.

![Figure 9: close range dry port](sources)

Even though the development of dry port brings numerous benefits to all stakeholders in a transport system, for instance, increase cargo flows, reduction in cargo transport cost and increased efficiency; there still exist some impediments such as optimal land use, infrastructure, environmental and institutional impediments which may affect the functionality and purpose of a dry port (Tsilingris and Laguardia, 2007 and Roso et al, 2009).

In order to mitigate these impediments and create an effective seaport inland access, synergizing and coordinating the activities of all actors in the transport system is of paramount importance, thereby creating a seamless flow of cargo and information amongst actors of the seaport and dry (Van der Horst and De Langen, 2008). The synergy and coordination of stakeholders’ activities
will also enhance the timely scheduling of transport facilities such as cargo trains, barges and trailer trucks from seaport to dry port and vice versa.

Actors or stakeholders in the development and functionality of dry port can be categorized into the following three broad categorize; that is:

- The community,
- Dry port service providers and
- Dry port users.
These categories can be further sub-categorized as shown below.

Figure 10: Dry port actors/stakeholders

Sources: Authors; Adopted from Macharis & Bontekoning, 2004
A brief explanation of the stakeholders is as follows:

- **Community;** includes stakeholders such as road users, local community, local governments/municipalities/city councils who are prime defenders of local community interest such as job creation, reduction of pollution levels and other externalities etc.

- **Service providers;** include dry port investors and operators, who show great interest and provide seed capital for investment in infrastructure and superstructure. Financial viability of such projects are properly examine couple with the potential for future development.

- **Users;** includes shippers, logistics providers, transport companies and freight forwarders. Their primary attractiveness and aim is logistics efficiency in cargo movements from the regional economic zones in the hinterland to the seaport (Macharis and Bontekoning, 2004).

### 4.1.1 Policy formulation for dry port implementation

The cornerstone for any development agenda is the formulation of specific policies to serve as the basis upon which such developments are built upon. Hanaoka and Regmi (2011) deliberated that, dry port development most be anchored on sound Government policies covering transport and trade facilitation, infrastructure, environment, multimodal transport, logistics and port and investment policies. Because of divergent interest of stakeholders in dry port location and development, having policies that will cover the interest of all stakeholders is of paramount importance (Caris, Macharis and Janssens, 2012). For these reasons, coordinating and aligning all the above mentioned policies at various sectors and Government Departments is essential; Jeevan, Chen and Cahoon (2017). To achieve this, designating a lead or coordinating agency or Government Department to provide potential developers of dry port projects with one stop-shop services and advice, including all necessary government approvals during both planning and operation, will facilitate and streamline the dry port development process, (World Bank port reform toolkit, 2003).

Investment policy, such as public private partnership (PPP) in dry port operations, is widely adopted globally, involving both the participation of public and private sector in financing and operating dry ports. In this investment model, the Government or public sector provides the
infrastructure; for example, land and also serve as the regulator, overseeing the activities of the dry port operators. Conversely, the private sector invests in the superstructure and operate the terminals (World Bank port reform toolkit, 2003). Private sector investment in dry ports could take different concessional modes, ranging from Build Operate and Transfer (BOT), Build Own Operate and Transfer (BOOT) or Build Own and Operate (BOO), (World Bank port reform toolkit, 2003).

Multimodal transport policy stimulates coastal shipping, inland waterway transportation and the utilization of dry ports. The benefits of linking dry port to seaport include reduction in ship, train and container turnaround times, prevention of excessive charges and promising continuity of container volume to seaports (Suarez-Aleman, Trujillo & Cullinane, 2014 and Garnwa et al. 2009). For instance, in Chile, the implementation of multimodal transport policy enabled the increment of container traffic at San Antonio seaport by 50% (San Antonio Port container traffic report, 2014). A multi-modal transport policy encourages modal shifts in a freight transport system, which affects time and costs of freight movements (Horst et al. 2011).

The effectiveness of the above government policies cannot be achieved without infrastructure policy; thus, investment in transport infrastructure such as roads, rail lines and barges for inland waterway connectivity to and from seaports is crucial (Jeevan, Chen and Cahoon, 2017).

For a successful implementation and development of a dry port, there is also need for the setting of clear policies and institutional arrangements in the selection of dry port location (UNCTAD, 1991).

Furthermore, Jeevan, Chen and Cahoon (2017) contested that, a lack of clear policies and institutional arrangements, or competing interests among actors/stakeholders, can pose severe threats or derail the selection of the best possible location of a dry port amongst different options. The factors that affect the location of a dry port they contested, include dry port proximity to seaport, connections to other modes of transport; cost of development and operation, environmental concerns, potential to attract manufacturing and distribution facilities; and economic stimulus for regional economic development.

Moreover, the creation of special economic zones or free trade areas for tax incentives should also be located within or in close proximity to the dry port to induce demand for dry port services (Jeevan, Chen and Cahoon, 2017).
The figure below depicts the policies necessary for dry port development.

![Diagram](image)

**Figure 11: Policies and regulations for dry port development**

*Source: Authors, adopted from Hanaoka and Regmi (2011)*

The above figure is an indication of the various policies necessary for a successful dry port implementation.

### 4.2.0 Conceptual framework to evaluate dry port location

Developing dry ports requires a methodological approach which may include:

- The inclusion of multiple stakeholders’ perspectives;
- The inclusion of softer location factors and indicators and
- Environmental consideration (Nguyen and Notteboom 2016)

Because of the huge sunk cost required and multi stakeholder interest in dry port development, decision making in its location, investment and operations calls for a systematic and inclusive
approach. As mentioned above, the main stakeholders in a dry port setting include seaport actors, shippers, freight forwarders, investors, terminal operators, central and local government, infrastructure managers, local residents and road users (Jarzemskis and Vasiliauskas, 2007). Also Nunez (2012) and Notteboom and Rodrigue (2007) debated that dry port location could be influence by factors such as economic, non-economic, qualitative or quantitative, environmental, land and labor availability, information and technology, financial viability and reliability.

In their research work to determine the best dry port location in Vietnam, Nguyen and Notteboom (2016) used a multi-criteria dry port site selection and location models known as MADM and LAMBIT models for decision making process. These models cluster dry port stakeholders into terminal users, terminal service providers and the community.
The hierarchical decision making process is as follows;

![Decision Making Process Diagram]

**Step 1:**

**Step 2:**
- Users
- Investors/operators
- Community

**Step 3:**
- Weight/preference (for Users, Investors/operators, Community)

**Step 4:**
Multi criteria analysis: Global ranking/Sensitivity analysis

*Figure 12: MADM & LAMBIT multi-criteria dry port location selection model*

*Sources: Authors, adopted from Nguyen & Notteboom the Asian Journal of shipping & Logistics (2016)*
A step by step multi-criteria dry port site selection and location model created by Nguyen and Notteboom is explained below as follows:

**Step 1: Preliminary research to identify location alternatives**

According to Nguyen and Notteboom (2016), the preliminary research or analysis of various location options is done to identify the most suitable location for dry port development. The criteria for possible location selection comprise of factors such as freight demand, overall capacity, expansion ability, connectivity, natural and society restrictions, international importance and users’ special needs. This involves discrete choices for potential location assessment, which serves as a basis for the next steps.

**Step 2: Clustering stakeholders and measuring methods**

All stakeholders/actors involved in dry port planning and development are clustered into three broad categories comprising of service providers, users, and community. The service providers consist of investor or operators who absorbed the sunk cost with an interest in financial viability, internal rate of return, payback period and future development potential of the dry port. The users include shippers, logistics providers, transport companies and freight forwarders. The third stakeholder is the community. The community covers the local government, road users and local residents who care about job opportunities, environmental impacts or externalities, and the economy. The classification of stakeholders is imperative for gauging the opinions of all actors whether through consultative meetings, interviews or questionnaires (Nguyen and Notteboom 2016).

**Step 3: Weighing methods**

In order to carry out the multi criteria analysis, each factor in the location criteria selection is assigned a weight of importance. These weights are often collated by a special panel during the consultation process, interviews or through questionnaires distributed to various stakeholders. There are numerous ways to obtain attribute weights, such as analytical hierarchy process (AHP), SWING, direct point allocation and the simple multi-attribute rating technique or SMART (Notteboom and Rodrigue, 2016).
Step 4: MADM analysis

Nguyen and Notteboom (2016) concluded that the weight given or allocated to each factor in step three, should be analyze using the multi-criteria technique to rank the alternatives or through using a hierarchical decision tree. This will enable the optimization of the location decision making process in terms of time, cost and effectiveness. Furthermore, the weight allocated to each factor can be inputted into a software thereby providing visual representation of the results.

For instance, Notteboom and Nguyen (2016) develop a set of multi-criteria technique relevant for all stakeholders involve in determining dry port location in Vietnam.
Below are their criteria, indicators and measuring methods of relevance for the various stakeholder groups involved in this decision making process.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Indicators</th>
<th>Measuring methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand for dry port services</td>
<td>Forecasting container flow</td>
<td>Acquired from planning process through forecasting the current current container traffic in TEUs</td>
</tr>
<tr>
<td>Investing and operating cost</td>
<td>- Land Cost</td>
<td>Acquired from the planning phase and local Government records</td>
</tr>
<tr>
<td></td>
<td>- Labor Cost</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Energy Cost</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Rail, barges and road Construction cost</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Dry port terminals cost</td>
<td></td>
</tr>
<tr>
<td>Potential to expand</td>
<td>Enough land area adjacent to the dry port for future expansion need</td>
<td>Determine during the planning phase</td>
</tr>
<tr>
<td>Investment and Operational climate</td>
<td>- Political and business friendly environment</td>
<td>Expert evaluation or using existing indexes</td>
</tr>
<tr>
<td></td>
<td>- Financial and economic environment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Government support</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Competition</td>
<td></td>
</tr>
<tr>
<td>Inter-project spillover effects</td>
<td>- Reputation Enhancement</td>
<td>Expert evaluation</td>
</tr>
<tr>
<td></td>
<td>- Capability upgrading</td>
<td></td>
</tr>
</tbody>
</table>

*Table 2: List of criteria necessary for dry port service providers*

*Sources: Authors, adopted from Nguyen & Notteboom the Asian Journal of shipping & Logistics (2016)*
<table>
<thead>
<tr>
<th>Criteria</th>
<th>Indicators</th>
<th>Measuring methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction of transportation cost</td>
<td>Cost saved by using intermodal transport services to &amp; from dry port</td>
<td>Comparison of the available transport system</td>
</tr>
<tr>
<td>Reduction of transportation time</td>
<td>Time saved by using intermodal transport system</td>
<td>Compare the time taken for transportation of cargo using the different transport modes</td>
</tr>
</tbody>
</table>
| Accessibility to road Infrastructure | -Proximity to highways  
                          | -Average daily traffic  
                          | -Level of service                                      | Expert evaluations                      |
| Accessibility to railway Infrastructure | -Proximity  
                             | -Capacity  
                             | -Frequency  
                             | -Reliability                                         | Expert evaluation                      |
| Accessibility to inland waterway infrastructure | -Proximity  
                                         | -Capacity  
                                         | -Frequency  
                                         | -Reliability                                        | Expert evaluation                      |
| Proximity to production base     | -Distance to target production base             | Expert evaluation                                      |
| Range of service                 | -Service availability                          | Expert evaluation                                      |
| Proximity to other logistics platform | -Distance                                      | kilometers from seaport to dry port                    |

*Table 3: List of criteria for dry port users*

*Sources: Authors, adopted from Nguyen & Notteboom the Asian Journal of shipping & Logistics (2016)*
<table>
<thead>
<tr>
<th>Criteria</th>
<th>Indicators</th>
<th>Measuring methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complementary with other multimodal transport systems</td>
<td>multimodal transport systems</td>
<td>Expert evaluation</td>
</tr>
<tr>
<td>Inland transport &amp; seaport planning</td>
<td>The particular location of the dry port</td>
<td>Expert evaluation</td>
</tr>
<tr>
<td>Contribution to land use reorganization</td>
<td>-Tax Paid</td>
<td>Expert evaluation</td>
</tr>
<tr>
<td></td>
<td>-Value added</td>
<td></td>
</tr>
<tr>
<td>Maximizing value added Services and return to Government</td>
<td>Number of estimated employees</td>
<td>Estimation based on dry port planning project</td>
</tr>
<tr>
<td>Minimizing transportation Pollution</td>
<td>CO2 reduced per TEU per route by modal shift</td>
<td>Estimation</td>
</tr>
<tr>
<td>Dry port related pollution created</td>
<td>Affected Pollution</td>
<td>Population in resident areas within a certain radius of the location</td>
</tr>
<tr>
<td>Noise level</td>
<td>Amount of noise generated</td>
<td>Expert evaluation</td>
</tr>
<tr>
<td>Minimizing road congestion</td>
<td>local traffic and road use</td>
<td>Analysis of road traffic</td>
</tr>
</tbody>
</table>

*Table 4: List of criteria relevant for community as stakeholder for dry port development*

*Sources: Authors, adopted from Nguyen & Notteboom (2016)*
The above mentioned list of criterions for multi-stakeholder perspective are necessary according to Nguyen and Notteboom (2016). This they contested will permit a preliminary research on alternatives location considering all necessary factors that cannot be overlooked in developing a feasible and sustainable dry port. Their analogy is that, stakeholders for instance community, service providers and users have diverse interest which all need to be considered if the investment is to be deemed viable in the short, medium and long term.
Chapter 5: Case study; Developing dry port in the Gambia

This chapter provides an overview of Banjul Port and the constraints it is faced with to warrant the development of a dry port. Likewise, Banjul Port KPIs that measure congestion level is also analyzed coupled with an analysis of respondents views on dry port implementation in the Gambia.

5.0 Overview of Banjul Port

Banjul Port is the focal point of transportation in the Gambia and serves as a gateway to and from the country, handling over 85% of import and export commodities traded in the country, (GPA Management & GBoS annual reports, 2014). The port was established by an Act of Parliament call the “Port Act, 1972” and its Board of Directors and Management are charge with the responsibility of construction, maintenance and operation of port infrastructure and superstructure. This Act of parliament makes Banjul Port a public service port. Situated at the mouth of the River Gambia in the capital city of Banjul, the port is under the purview of the Ministry of Works, Transport and Infrastructure which sets and regulates transport policies in the country.

The figure below depicts the location of the port in the city of Banjul

![Location of Banjul port in the city of Banjul](image)

*Figure 13: Location of Banjul port in the city of Banjul*

*Source: Google earth*

Tasked with the monitoring and control of the daily activities of the Port, the Management team is headed by the Managing Director and supported by seven other Directors, heading departments such as the Traffic and Logistics Department, Corporate and Business Development Department,
Finance Department to name but a few. Banjul Port is a feeder port with multi-purpose berthing facilities. The port has six berth facilities namely berth 3A, 3B, berth No. 1, No. 2, No. 4 and No. 5.

The table below shows the number and depth of berth facilities available at Banjul Port

<table>
<thead>
<tr>
<th>Berth number</th>
<th>Depth (meters)</th>
<th>Type of ship handled at the berth</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 1</td>
<td>9</td>
<td>Dry-bulk vessel only</td>
</tr>
<tr>
<td>No. 2</td>
<td>6</td>
<td>Dry-bulk vessel only</td>
</tr>
<tr>
<td>No. 3A</td>
<td>12</td>
<td>Cellular, Ro-Ro, Cruise and dr-bulk</td>
</tr>
<tr>
<td>No. 3B</td>
<td>12</td>
<td>Cellular, Ro-Ro, Cruise and dr-bulk</td>
</tr>
<tr>
<td>No. 4</td>
<td>8.5</td>
<td>Dry-bulk vessel only</td>
</tr>
<tr>
<td>No. 5</td>
<td>6</td>
<td>Dry-bulk vessel only</td>
</tr>
</tbody>
</table>

Table 5: Banjul Port berth facilities, depth and specification

Sources: Harbors Dept. data, Banjul Port

Due to limited berth facilities, the port uses priority berthing system to allocate its berths. The sequence of this berthing system is as such, priority is given to cruise ships, Ro-Ro, container and dry bulk vessels accordingly. This sequence is designed according to the depth and availability of berth and the service time required for a particular ship.

Banjul Port shares overlapping hinterlands with the Ports of Dakar, Senegal; Conakry, Guinea and the port of Bissau (African Development Bank Group report 2016). Up until late 1990s, river and road networks were the backbone of transportation system in the Gambia, connecting the port and its hinterland. The River Gambia is navigable by ocean going vessels and barges with 300 gross tonnage capacity for about 240 km to 500 km into the hinterland (African Development Bank Group report 2016). In 1984, inland terminals were developed at Ballenghar, Kaur, Kuntaur, Georgetown were export cargos such as groundnuts, cotton and cashew nuts from surrounding villages and towns in the Gambia, Senegal, Guinea Conakry and Bissau were consolidated, loaded on barges and transported to the port via the river for onward exports to Europe and Asia.
The figure below illustrates the location of Banjul Port and its overlapping hinterland with other ports in West Africa Sub-region.

![Maps of the Gambia and the sub-region](image)

*Figure 14: Maps of the Gambia and the sub-region*

*Source: Adopted from ADB group report 2016 on transport network diagnostic study: The Gambia*

Conversely, imported cargos such as sugar, rice, European and Chinese manufactured garments and other commodities were offloaded at the port and loaded on barges destined for the hinterland. However, since late 1990s, this strategic subsector of the transport system has been adversely weakened due to dilapidated inland terminal facilities coupled with the development of more road networks.

Nevertheless, the Port continuous to be a mainstay in the transportation system of the country handling 305 cargo ships on average annually in the last decade. Below are the categories of ships that called Banjul port during the period of 2009 to 2018.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cellular</td>
<td>124</td>
<td>129</td>
<td>122</td>
<td>133</td>
<td>141</td>
<td>145</td>
<td>124</td>
<td>123</td>
<td>123</td>
<td>137</td>
</tr>
<tr>
<td>Dry-bulk</td>
<td>71</td>
<td>148</td>
<td>167</td>
<td>146</td>
<td>123</td>
<td>143</td>
<td>148</td>
<td>91</td>
<td>102</td>
<td>71</td>
</tr>
<tr>
<td>Ro-Ro</td>
<td>26</td>
<td>19</td>
<td>13</td>
<td>14</td>
<td>28</td>
<td>22</td>
<td>20</td>
<td>26</td>
<td>26</td>
<td>10</td>
</tr>
<tr>
<td>Cruise</td>
<td>10</td>
<td>9</td>
<td>8</td>
<td>7</td>
<td>19</td>
<td>17</td>
<td>5</td>
<td>7</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>General cargo</td>
<td>11</td>
<td>6</td>
<td>16</td>
<td>20</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>10</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Liquid-bulk</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>33</td>
<td>32</td>
<td>38</td>
<td>54</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>242</strong></td>
<td><strong>311</strong></td>
<td><strong>326</strong></td>
<td><strong>320</strong></td>
<td><strong>311</strong></td>
<td><strong>330</strong></td>
<td><strong>334</strong></td>
<td><strong>289</strong></td>
<td><strong>298</strong></td>
<td><strong>284</strong></td>
</tr>
</tbody>
</table>

*Table 6: Registered ship calls at Banjul port (2009 – 2018)*

*Source: Banjul Port Harbors Dept.*
This research will focus mainly on cellular and Ro-Ro ships calls as they are the two categories of ship for container transport.

In the last ten years (2009 to 2018), the port has witnessed and increase in cargo traffic from 1.44 million metric tonnes in 2009 to 2.47 million metric tonnes in 2018; representing 172% rise.

Like many seaports, Banjul port has in recent times witnessed an increased in unitization of cargo which has been a trend in international seaborne trade.

The table below describes the increase proportion of containerized cargo to total cargo traffic handled at Banjul Port.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Container traffic</td>
<td>856,153</td>
<td>992,004</td>
<td>1,294,715</td>
<td>1,210,373</td>
<td>1,120,787</td>
<td>1,376,289</td>
<td>1,299,396</td>
<td>1,494,659</td>
<td>1,706,230</td>
<td>1,823,472</td>
</tr>
<tr>
<td>Total Cargo</td>
<td>1,440,546</td>
<td>1,548,240</td>
<td>1,856,523</td>
<td>1,754,562</td>
<td>1,603,122</td>
<td>1,921,778</td>
<td>1,847,555</td>
<td>2,063,300</td>
<td>2,444,717</td>
<td>2,471,409</td>
</tr>
<tr>
<td>Container traffic:total cargo</td>
<td>59%</td>
<td>64%</td>
<td>69%</td>
<td>69%</td>
<td>70%</td>
<td>72%</td>
<td>70%</td>
<td>72%</td>
<td>70%</td>
<td>74%</td>
</tr>
</tbody>
</table>

Table 7: The proportion of container traffic to total cargo handled

Source: GPA cargo traffic reports; 2009 to 2018

The above table indicates that the proportion of container traffic to total cargo handled at the port increased from 59% in 2009 to 72% in 2014. The growth in containerized, necessitated the buying of properties adjacent to the port for spatial port capacity increment. Operations on the new container terminal started in 2015, providing the much needed space which temporarily relieved the port from congestion and its effects on operations.

As container traffic continued to rise from 1.3 million metric tonnes in 2015 to 1.8 million metric tonnes in 2018, congestion is again prevalent at the port and its vicinity.
The figure below indicates the rise in container traffic post inauguration of the new container yard in 2015.

![Graph showing container traffic in metric tonnes handled at Banjul Port]

*Figure 15: Container traffic in metric tonnes handled at Banjul Port*

*Source: GPA cargo traffic reports; 2009 to 2018*

The above figure is indicative of container traffic handled at Banjul Port during the period. A fluctuating trend is observed between the year 2009 to 2015 with contractions in 2012, 2013 and 2015. In 2012 and 2013 the Gambia experienced erratic rainfall which affected exports commodities such as groundnuts and other agricultural produces. In addition, the Government of the Gambia also placed an embargo on timber export, which at that time was the second highest export commodity. Contraction in 2015 was due to the Ebola disease outbreak which plagued some countries in West Africa and thus affected trade in the sub-region.

Different from 2015 going forward, container traffic witnessed a steady rise to the peak in 2018, which consequently engendered port congestion.

### 5.1.0 Data Analysis

The data analyzed herein serves as the barometer to gauge the level of congestion at Banjul Port. According to Bichou and Gray 2004, port congestion is attributed to physical indicators of port productivity and efficiency and are often referred to time measures. This includes ship waiting/anchorage time, ship time at berth, berth occupancy rate, ship turnaround time and cargo dwell time in port (Golias, Saharidis, Boile, Theofanis & Lerapetritou, 2009). These port KPIs will therefore be used in this research to measure Banjul Port congestion level.
5.1.1 Average ship waiting time

Average ship waiting time is also known as ship time at anchorage. This measures the time interval a ship arrives in port and the time its allocated a berthing slot (Bichou and Gray 2004). Ships calling Banjul port are required to announce their estimated time of arrival 24 hours before entering the territorial waters of the Gambia. This allows the concern authorities at the port (Harbors and Traffic Depts.) to make the necessary arrangements in terms of berth space and cargo handling gears required for a particular ship operation.

However, due to constraints like limited berth facilities and handling equipment and congestion at container yards, ships arriving at port tend to spend time at anchorage waiting to be allocated a berthing slot. The figure below depicts the average ship waiting time at Banjul Port.

![Average ship waiting time graph]

**Figure 16: Cellular and Ro-Ro ships average waiting time at Banjul port (2013 – 2018)**

**Sources: Banjul Port Harbors Dept. ship registry data**

The above figure indicates the number of hours Cellular and Ro-Ro ships spend at anchorage waiting for berthing slot. The average ship waiting time was relatively better in 2013 to 2015 compared to 2017 and 2018. Between 2013 to 2016, the highest average ship waiting time was 16 hours recorded in 2014. However, in 2017 the port experience a rise in average waiting time from 14 hours in 2016 to 29 hours in 2017. Similarly, the average waiting time more than double in 2018 reaching 74 hours from 2017. This rise in waiting time is mainly due to congestion at the
container yards, due to lack of enough space to accommodate the increase inflow of container traffic.

As a result, subsequent ships arriving in port tend to spend more time at anchorage, sometimes creating a backlog of ships waiting for berthing slot.

5.2.0 Average Ship time at berth

The average ship time at berth measures the average time Cellular or Ro-Ro ship spend at berth to discharge and load cargoes (Slack, Comtois, Wiegmans & Witte, 2018). This is sometimes known as average ship operating time (Notteboom, 2006 and Dragovic, Park Kyu & Radmilovic, 2011). The average ship time at berth is an important productivity indicator as it measures the overall organization and performance of a port in terms of labor (moves per hour), equipment (crane moves per hour) and container yard productivity.

The average ship time at berth have been steadily rising at Banjul Port from 39 hours in 2013 to 81 hours in 2018 as illustrated on below.

![Average ship time at berth](image)

*Figure 17: Average ship time at berth in 2013 – 2018*

*Sources: Banjul Port Harbors Dept. ship registry data*

It can be argued that the steady increase in average ship time at berth was mainly due to increase container traffic recorded during these periods. Container traffic in TEUs handled at the port during these periods rose from 70,300 TEUs in 2013 to 130,492 TEUs in 2018. This rise posed several
challenges to the port including saturation of container storage spaces, low ship productivity, which subsequently increases the cost shipping lines and cargo owners incur.

5.2.1 Average ship turnaround time

Ship turnaround time measures the overall time a ship spends in port (Clark, Dollar & Micco, 2004 and Suarez-Aleman, Trujillo and Cullinane, 2014). It is the addition of the waiting time and ship time at berth. The average turnaround time for cellular and Ro-Ro ships at Banjul has witnessed a steady increase from 2015 to 2018. This increase is attributed to a rise in both average waiting time and ship time at berth.

Below figure shows the average turnaround time of ships at Banjul Port in 2013 to 2018.

![Average ship Turnaround time](image)

*Figure 18: Average ship turnaround time in 2013 – 2018*

*Sources: Banjul Port Harbors Dept. ship registry data*

The increase in average turnaround time of ships calling Banjul Port means additional cost incurred for shipping lines and consignees. Container ships are mainly on time or voyage charters and therefore any delay in port increases their operational and bunker costs. The efficiency of seaside operations including waiting, operating and turnaround times of ships are crucial for reducing the overall time and costs for in the supply chain. As a nodal point in the transportation network, Banjul Port should aim at reducing the time ships spend on seaside operations to maintain its reputation and competitiveness in the West African sub-region.
5.3.0 Average container dwell time

The average container dwell time in port measures the number of days’ cargo/containers spend in port before either being delivered to the consignee or loaded into a ship for export (UNCTAD 1991). This measures the efficiency of container yard operations. At Banjul Port, both import container FCLs and empty containers meant for export are given five working days’ grace or rent free period beyond which punitive/demurrage charges are levied (Banjul Port revised port tariffs, 2008). However, export FCLs are exempted from any punitive/demurrage charges and therefore could be stacked at the port for weeks or months. This was a directive from the Government of the Gambia aimed to boast the country’s export trade.

The figure below illustrates the average container dwell time of import and export FCLs and empty containers at Banjul Port.

![Average container dwell time](image)

**Figure 19: Average container dwell time in port (2013 – 2018)**

*Sources: Banjul Port Traffic and Logistics Dept.*

From the above figure it is evident that both import FCLs and export empties overstay beyond their grace or rent free period. In recent times, 2016 to 2018, the average dwell time of import FLCs, export FCLs and export empties have recorded a steady increase. There are multiple factors responsible for the overstay of import FCLs at Banjul Port including multiple mandatory inspection checks such Police, National Drug Enforcement Agency, scanning machine and customs checks. All this checks are carried out individually and therefore contributes to the increase of average container dwelling time at the port. In addition, the port also lacks a proper
container tracking system to ascertain the specific slot a particular container is stacked. Therefore, containers are tracked manually by clearing agents to ascertain their slot or stacked area.

5.3.1 Questionnaire data analysis

The analysis and result from the responses received from respondents are also used as a basis to answer the research questions. The questionnaires seek to gather data from individuals and organizations directly involved in operations at Banjul Port.

Below is a synopsis of the targeted respondents for the research.

<table>
<thead>
<tr>
<th>Respondent profile</th>
<th>Target number</th>
<th>Number responded</th>
<th>No response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shipping lines</td>
<td>5</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>Freight forwarders</td>
<td>8</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Local residents</td>
<td>5</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>Haulage truck owners</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Clearing agents</td>
<td>5</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Port staff</td>
<td>5</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>Major importers</td>
<td>5</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Major exporters</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>33</strong></td>
<td><strong>7</strong></td>
</tr>
</tbody>
</table>

*Table 8: List of targeted respondents*

*Source: Compiled by Author*

Forty questionnaires were distributed to the above listed Banjul Port stakeholder with a response rate of 83%. This therefore enabled the researcher to understand how congestion at Banjul port could be averted by developing a dry port.
In analyzing and interpreting the questionnaires, the researcher categorizes the questionnaire into three categories; namely:

- **Physical attributes of Banjul Port**

  In this category, the questions asked were basically to understand how physical attributes of the port such as inadequate berthing facilities, lack of enough container storage capacity and intermodal connectivity are contributing to port congestion.

  The summary of opinions from respondents are shown below

  ![RESPONSES ON PHYSICAL ATTRIBUTES OF BANJUL PORT](image)

  *Figure 20: Respondents view on physical attributes contributing to Banjul Port congestion*

  *Source: Compiled by Author*

  From the above figure, respondents strongly agreed that inadequate berthing facilities, lack of enough storage capacity and intermodal connective and inadequate warehousing facilities within the port’s premises are the contributing factors to port congestion.

- **Organization attributes of Banjul Port**

  Factors contributing to port congestion do not only stem out from physical attributes of a port but also the organization attributes. Amongst these attributes, lack of M I S, segregation of container yards per shipping line, inadequate quantity and quality of cargo handling equipment and
supervision, monitoring and control of port services are also factors respondents view as contributing factors to Banjul Port congestion. Below are the opinions of respondents.

**Figure 21: Respondents view on organization attributes contributing to Banjul Port congestion**

*Source: Compiled by Author*

The figure above illustrates a high degree of agreement from respondents that organization of Banjul port also contribute to port congestion. For example, lack of integrated management information system between port stakeholders limits the flow of cargo information amongst actors in the supply chain and thus complements to the increase dwell time of cargo at the container yards. Moreover, inadequate quantity and quality of cargo handling equipment and inadequate supervision, monitoring and control of port services create bottlenecks leading to congestion. Finally, respondents strongly agree that lack of demarcation of container yards per shipping line also exacerbate congestion. Import containers from all shipping lines are stacked randomly together. Containers at Banjul port are stacked seven to eight high during peak periods in order to accommodate more containers in the stacking areas.

- **Need for dry port development to decongest Banjul Port**

The implementation of dry port requires the efforts of both public and private organizations and businesses due to the diverse interest of stakeholders involve in dry port operation (Li, Hu and Shi,
With spatial expansion constraints Banjul Port is challenged with, the researcher asked respondents whether there is need for development of dry port to address these challenges. Below are the opinions of respondents.

**Figure 22: Need for dry port development to decongest Banjul Port**

*Source: Compiled by Author*

The responses gathered indicate that respondents strongly agree developing a dry port could be used as a means of decongesting Banjul Port. In addition, it also shows that developing dry port in the hinterland of the Gambia could help revive river transport which up until late 1990s was a key component of transportation network in the Gambia.

Furthermore, local residents around the port vicinity believed that such a project will go a long way in reducing the noise level and road congestion in the city of Banjul. Rohács and Simongáti, 2007, debated that noise produced by ships or barges, as compared to other transport modalities (trucks, planes, trains) is not considered as relevant.

Finally, 45% and 39% of respondents agree and strongly agree respectively that developing a dry port in the hinterland of the Gambia will increase Banjul port efficiency and productivity and in the near future and long run increase cargo traffic.

From the above analysis, it can be argued that developing a dry port in the Gambia will relieve Banjul Port from the persistent congestion problems it is faced with. Equally, it is also necessary
to highlight that developing a dry port is never straightforward as its implementation and functionality involves many stakeholders with divergent interest.

5.4.0 Summary of data analysis

In brief, the analyzed port data and responses generated from questionnaires indicated that Banjul Port is experiencing an increase ships time in port. This could be attributed to increase container traffic and container dwell time as illustrated in the table below.

| Source: Compiled by Author |

| Table 9: Summary of Banjul Port analyzed data |

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total container yards storage area (in square meter)</td>
<td>43,800</td>
<td>43,800</td>
<td>59,000</td>
<td>59,000</td>
<td>59,000</td>
<td>59,000</td>
</tr>
<tr>
<td>Container traffic (in TEUs)</td>
<td>70,300</td>
<td>85,172</td>
<td>83,809</td>
<td>93,190</td>
<td>108,284</td>
<td>130,492</td>
</tr>
<tr>
<td>Average ship waiting time (in hours)</td>
<td>6</td>
<td>16</td>
<td>12</td>
<td>14</td>
<td>29</td>
<td>74</td>
</tr>
<tr>
<td>Average ship time at berth (in hours)</td>
<td>39</td>
<td>61</td>
<td>62</td>
<td>66</td>
<td>71</td>
<td>81</td>
</tr>
<tr>
<td>Average ship turnaround time (in hours)</td>
<td>45</td>
<td>77</td>
<td>74</td>
<td>80</td>
<td>100</td>
<td>155</td>
</tr>
<tr>
<td>Average Import FCL dwell time in port (in days)</td>
<td>6</td>
<td>9</td>
<td>8</td>
<td>8</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>Average Export FCL dwell time in port (in days)</td>
<td>12</td>
<td>16</td>
<td>14</td>
<td>16</td>
<td>17</td>
<td>22</td>
</tr>
<tr>
<td>Average Ex port MT container dwell time in port (in days)</td>
<td>10</td>
<td>14</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>16</td>
</tr>
</tbody>
</table>

The table above indicates that since 2015 when the port increased its storage capacity from 43,800 to 59,000 square meters, container traffic has steadily rose from 83,809 TEUs to 130,492 TEUs in 2018; registering an average growth of 15%. Comparatively, ships waiting, time at berth and turnaround times coupled with dwell time of import and export FCLs and empty containers also witnessed a steady rise. The lack of enough storage area to absorb the increase in container traffic is the primary reason for increase in ship waiting and turnaround times. Equally, the increase in dwell time of import and export FLCs from 8 and 11 days in 2015 to 12 and 16 days in 2018 respectively also contributed in exacerbating port congestion.
Similarly, to contextualize the analysis provided above on respondents’ view regarding factors responsible for congestion at Banjul Port, the tables below provide a summary of respondents’ opinions.

<table>
<thead>
<tr>
<th>Physical contraints</th>
<th>Disagree</th>
<th>Strongly disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate berth facility</td>
<td>0%</td>
<td>6%</td>
<td>15%</td>
<td>27%</td>
<td>52%</td>
</tr>
<tr>
<td>Lack of enough storage capacity</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>24%</td>
<td>76%</td>
</tr>
<tr>
<td>Lack of enough multimodal connectivity</td>
<td>9%</td>
<td>3%</td>
<td>12%</td>
<td>15%</td>
<td>61%</td>
</tr>
<tr>
<td>Inadequate warehousing facility</td>
<td>12%</td>
<td>3%</td>
<td>12%</td>
<td>18%</td>
<td>55%</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>5%</td>
<td>3%</td>
<td>10%</td>
<td>21%</td>
<td>61%</td>
</tr>
</tbody>
</table>

Table 10: Respondents view on physical attributes contributing to Banjul Port congestion  
**Source:** Compiled by Author

From the above table, 61% of responses on average strongly agree that physical constraints such as inadequate berth facility, lack of enough storage capacity and multimodal connectivity and inadequate warehousing facilities are amongst factors responsible for congestion at Banjul Port.

Comparatively, responses generated also indicate that 43% of respondents on average both agree and strongly agree that organizational constraints at the port also contribute to port congestion.

In addition, the below table provides summaries the opinions of respondents on organizational constraints of Banjul Port.

<table>
<thead>
<tr>
<th>Organizational contraints</th>
<th>Disagree</th>
<th>Strongly disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of Management Information System</td>
<td>6%</td>
<td>3%</td>
<td>6%</td>
<td>21%</td>
<td>64%</td>
</tr>
<tr>
<td>Inadequate supervision, control and monitoring</td>
<td>12%</td>
<td>6%</td>
<td>0%</td>
<td>61%</td>
<td>21%</td>
</tr>
<tr>
<td>Lack of segregation of container storage yards</td>
<td>0%</td>
<td>0%</td>
<td>3%</td>
<td>21%</td>
<td>76%</td>
</tr>
<tr>
<td>Inadequate quantity and quality of handling equipment</td>
<td>6%</td>
<td>6%</td>
<td>6%</td>
<td>70%</td>
<td>12%</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>6%</td>
<td>4%</td>
<td>4%</td>
<td>43%</td>
<td>43%</td>
</tr>
</tbody>
</table>

Table 11: Respondents view on organizational attributes contributing to Banjul Port congestion  
**Source:** Compiled by Author

From the above table, respondents opined that factors such as lack of management information system which is used for cargo and freight information sharing between port stakeholders, inadequate supervision, control and monitoring of ports services, lack of segregation of container
storage yards per shipping line and inadequate quantity and quality of handling equipment are
dem factors exacerbating Banjul Port congestion.

As a result of the aforementioned factors notably responsible for congestion at Banjul Port coupled
with the close proximity of the port to residential areas and other public facilities, the need for dry
port development in the hinterland to tackle port congestion was put forth to port stakeholders to
know their standpoint on the issue.

The table below represents the responses generated from some port stakeholders on the need for
developing a dry port to decongest Banjul Port.

<table>
<thead>
<tr>
<th>Need for dry port development</th>
<th>Disagree</th>
<th>Strongly disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is developing a dry port ideal for reducing port congestion</td>
<td>0%</td>
<td>0%</td>
<td>9%</td>
<td>18%</td>
<td>73%</td>
</tr>
<tr>
<td>Will developing a dry port reduce noise level and road congestion in Banjul</td>
<td>12%</td>
<td>6%</td>
<td>18%</td>
<td>52%</td>
<td>12%</td>
</tr>
<tr>
<td>Can developing a dry port in the hinterland help revive river transport</td>
<td>3%</td>
<td>6%</td>
<td>12%</td>
<td>21%</td>
<td>58%</td>
</tr>
<tr>
<td>Will developing a dry port boast Banjul Port cargo traffic</td>
<td>3%</td>
<td>0%</td>
<td>12%</td>
<td>45%</td>
<td>39%</td>
</tr>
<tr>
<td>Average</td>
<td>5%</td>
<td>3%</td>
<td>13%</td>
<td>34%</td>
<td>45%</td>
</tr>
</tbody>
</table>

*Table 12: Respondents view on the need for dry port development*

*Source: Compiled by Author*

From the table above, it is apparent that 34% and 45% respondents on average agree and strongly
agree respectively that developing a dry port is ideal for decongesting Banjul Port. Furthermore,
this number of respondents trust that developing a dry port will create opportunities such as
reduction in noise level and road congestion at the port gates and the City of Banjul. This also they
believe shall help revive river transport which could serve as an intermodal transport system
linking the port and its hinterland and ultimately relief the port form congestion, increase efficiency
and the long run boast Banjul Port cargo traffic.

5.4.1 Scenario analysis

Banjul Port in the last decade (2009 to 2018) has witnessed an average growth of 10% in container
traffic despite an increase congestion level experienced since 2016. This growth could be attributed
to lower port tariff compared to competing ports sharing the same hinterland such as the port of
Dakar, Conakry and Bissau, coupled with factors such as the strategic location of Banjul Port, steady increase in GDP and income per capita of over the years (GBoS annual report, 2015).

In order to understand how this growth could affect the port in the near future, the researcher conducts a scenario analysis, namely, optimistic, base and pessimistic cases.

The scenarios are as follows:

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>Growth level</th>
<th>Key words</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimistic case</td>
<td>15%</td>
<td>This could be the Best case average growth of the Port</td>
</tr>
<tr>
<td>Base case</td>
<td>10%</td>
<td>This the current average growth of Banjul Port for the last 10 days</td>
</tr>
<tr>
<td>Pessimistic case</td>
<td>5%</td>
<td>This could be the worst case average growth of the Port</td>
</tr>
</tbody>
</table>

Table 13: Scenario analysis of Banjul Port container traffic

Source: Compiled by Author

The rational for the growth of the three cases is that in the Base case, the researcher assumes that the average growth of the port will remain at 10% from 2018 to at least the next 5 years (2023). The reason being, the time ships and cargo spend in port is steadily increasing, especially from 2016. This means that shipping lines and cargo owners are spending more money in relation to port charges and demurrage which in the medium and long term will make the port of Banjul very unattractive for their businesses. Notwithstanding, shipping lines and freight owners may still use Banjul Port in the next five years even if the status quo remains the same.

In the Optimistic scenario, the assumption is that if the port invests in developing a dry port, it will generate more storage space which will lead to reduction in congestion level at the container yards, increase efficiency, a shorter ships time in port, revival of river transport in the Gambia, reduction in transportation cost of freight from the port to the hinterland, creation of new employment opportunities and consequently 15% growth in container traffic in the next five years.

However, the assumption of the Pessimistic scenario is based on the premise that if the current congestion level at Banjul port persist, the port will still experience a marginal average growth of 5% compared to the actual average growth of 10% witnessed in the last ten years. The reason being, there will be increase average time ships and cargo spend in port. When this assumption
occurs, the port will become unattractive to shipping lines and cargo owners due to increase punitive charges they will incur.

The table below illustrates the growth rate of the port in the next five years for the three scenarios.

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>Growth rate</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimistic case</td>
<td>15%</td>
<td>130,492</td>
<td>150,066</td>
<td>172,576</td>
<td>198,462</td>
<td>228,231</td>
<td>262,466</td>
</tr>
<tr>
<td>Base case</td>
<td>10%</td>
<td>130,492</td>
<td>143,541</td>
<td>157,895</td>
<td>173,685</td>
<td>191,053</td>
<td>210,159</td>
</tr>
<tr>
<td>Pessimistic case</td>
<td>5%</td>
<td>130,492</td>
<td>137,017</td>
<td>143,867</td>
<td>151,061</td>
<td>158,614</td>
<td>166,545</td>
</tr>
</tbody>
</table>

*Table 14: Scenario analysis of the three cases*

*Source: Compiled by Author*

From the above table, 2018 serves as the base year and the percentage growth added subsequently. To illustrate using the Optimistic case, in 2018, Banjul Port handled 130,492 TEUs and the researcher assumes that the port container traffic will further grow by 15% in 2019 from 2018; translating to 150,066 TEUs in 2019. This growth level is assumed to be maintained in the succeeding years and thereby a forecast of 266,466 TEUs to be handled in 2023.

Comparatively, the growth rate of the Base and Pessimistic cases are assumed to be 10% and 5% respectively. The Researcher presumes that these growth levels will be maintained on both scenarios in the subsequent years with 210,159 TEUS and 166,545 TEUs forecasted to be handled in 2023 respectively.

With 59,000 square meters’ container storage capacity, it is evident that Banjul port would not be able to accommodate even the Pessimistic future growth level due to limited capacity to spatially expand.

However, to viably and sustainably accommodate any of the future growth levels mentioned above, there is need for Banjul Port to invest in developing a dry port. This the researcher vehemently believes is more viable economically, socially and financial compared to buying properties adjacent to the port for capacity expansion purpose.
Chapter 6: Conclusion

It is apparent from the reviewed literature that dry ports are developed for several reasons amongst which include, extending the activities of a seaport into the hinterland, spatial expansion of seaport capacity, elongating the life cycle of a seaport and improving seaport competitiveness and efficiency. However, it is also worth mentioning that developing a dry port requires concerted efforts and co-operation of all port stakeholders such as Government and its transport related institutions, local community, the port, shipping lines, freight forwarders, haulage carriers (Brooks and Schellinck, 2015). All stakeholders are important for a successful development and implementation of a dry port.

Therefore, there is need for the formulation of numerous policies upon which the project will be anchored (Hanaoka and Regmi, 2011). Such policies constitute transport and trade facilitation, infrastructure, environment, multimodal transport, logistics and port and investment policies (Dwarakis & Muhammad-Salim, 2015).

Furthermore, selecting the ideal dry port location is also of primary importance. Generally, a dry port could be located at a far distant, mid-range or close range from the seaport depending on the purpose the dry port is intended to serve. A multi-criteria location selection process could be used to select the ideal location from the available options. This location selection criterion clusters stakeholders into three broad categories, consisting of dry port users, investors/operators and community (Nguyen and Notteboom, 2016 and Srour, Oosterhout, Baalen & Zuidwijk, 2008).

Finally, before the commencement of dry port layout and design, it is incumbent that the following are considered.

- The facilities and value added services to be provided.
- Multi-modal linkages such as rail, road and inland waterways and their capacities.
- Scope for future expansion and development.
- Environmental consideration with regards to noise and pollution levels of facilities.
- Forecasted or estimated traffic flow between seaport and dry port.
- Existence of auxiliary services such as banks and other services.

The location of Banjul Port constraints it spatial expansion in the present and future. Notwithstanding, the port can be spatially expanded by moving its activities into the hinterland.
through the development of a dry port. The buying of private properties adjacent to the port is not financially viable and sustainable to generate the much needed space required to accommodate the continuous trajectory of containerized cargo witnessed at Port. Dry ports developed in countries like Vietnam, Nigeria, China, South Africa and Spain are used to further the activities of seaports inland. This strategy could be deployed in the Gambia and thereby decongest Banjul Port.

In addition, developing a dry port in the hinterland of the Gambia could also contribute in reviving river transport and a better utilization of inland terminals at places such as Kaur, Kuntaur and Basse (ADB group report, 2016). One of these inland jetties could be transform into a dry port that can be used to transshipped or transport cargo from the seaport to the hinterland. In 2016, ADB group did a detailed analysis on the flow of freight based on origin/destination survey on the road network in the Gambia. It was revealed that weekly movements of construction and building material such as cement and other bulky freight transported by road could be shifted to river transport. The report indicates that, there are adequate hallmarks in terms of freight volume transported via road to the hinterland of the Gambia that can be diverted using barges through river transport.

6.1.0 Findings

Seaports globally are vital nodes in the logistic chain and must therefore provide shipping line, carriers and other ports users very reliable and efficient services including berthing of ships, guaranteed turnaround time and cargo dwelling time (Arvis, Vesin, Carruthers, Ducruet, & Langen, 2018). Port efficiency can be reflected in the freight rates charged by shipping lines and cargo owners (Tongzon and Oum, 2007, Jarzemskis & Vasiliauskas, 2007). Banjul Port data on Cellular and Ro-Ro ship calls indicates that the average waiting time of ships at anchorage has increased from 6 hours in 2013 to 74 hours in 2018, representing (68 hours); 1018% rise. What this translates is, Cellular and Ro-Ro ships that called Banjul Port during this period (2015 – 2018) have experienced an exponential rise in the time they spend waiting to be allocated berth slot. In addition, the average time these ships spend at berth also increased from 39 hours in 2015 to 81 hours in 2018; representing 107% rise. Subsequently the average turnaround time of these ships increased from 45 hours in 2013 to 155 hours in 2018, indicating 242% rise.
From the above paragraph, it can be deduced that the overall time these ships spend in Banjul Port have increased exponentially, which increases their operating and bunker costs incurred due to port inefficiency, exacerbated by congestion at the container yards. However, this cost is normally transferred along the logistics chain to the final customer, resulting to an increase in prices of commodities. This inefficiency could lead to unattractiveness and bad reputation to Banjul Port in the medium and long term.

Similarly, the dwell time of containers (import FCLs, export FCLs and export MTs) in port have steadily increase during the period (2013 to 2018). This increase in container dwell time creates a situation of opportunity cost to the port, constraining its ability to absorb and accommodate or stack more containers. Equally, the port generates revenue through punitive and demurrage charges levied to cargo owners for overstayed containers beyond the allowed five working days rent free period. With Banjul Port container traffic growing at 10% on average per year in the last decade, its present container storage capacity of 59,000 square meters is not adequate to accommodate this continuous rise. For this reason, increase ships time in port, inefficiency and congestion at the container yards have been never-ending. Again as highlighted on the scenario analysis, if the container traffic grows more than the base case to 15% or even less than the base case in the next five years, the location of the port would not permit a viable spatial port expansion.

Faced with numerous challenges including physical, organizational and financial, there is need for the Government of the Gambia in consultation with the port’s Board of Directors and Management to reorient or change the present port model from Public Service Port to a Landlord Port Model. This will attract private investment in port infrastructure and superstructure, potential creation of more maritime sector employment opportunities revival of river transport and creation of multimodal transport that could serve as an impetus to address these constraints faced by the port. Furthermore, a change of Port Management model could result to, proper planning at the strategic, tactical and operational levels and improve port efficiency and competitiveness in the West African sub-region. Most importantly also, this change in model could attract private sector investment in dry port which the researcher vehemently believe is more economically, socially, environmentally and financially viable compared to buying private and public facilities adjacent to the port for port capacity expansion purpose.
6.1.1 Recommendations

- Banjul Port still operates on a public service model in the midst of a changing industry environment. Most ports in the West Africa sub-region such as Dakar, Abidjan, Takroda, Lomé have restructured their port model from public service to landlord model (Harding, Palsson, Raballand, 2007). This has improved their productivity and efficiency over the years (ADB group report, 2016). The Government of the Gambia has to reorient its port management model and encourage private sector participation. This will enhance the productivity and efficiency of Banjul Port.

- The buying of private properties to expand Banjul Port is not sustainable in the near future. Therefore, there is need for the Government of the Gambia and the port’s Management to think of alternative solutions. A paradigm shifts from buying properties to developing a dry port will enable Banjul Port to improve it efficiency and remain competitive in midst of competition from neighboring ports like Dakar, Conakry and Bissau.

- The development of dry port should also be support by an integration system which integrate the activities of Banjul Port and would be dry port to create a lean and agile system for seamless flow of cargo and related information between the two nodes.

- The development of a dry port will help decentralized development drives in the country which relatively is concentrated in the City of Banjul and its satellite urban areas. By so doing will induce other socio economic benefits such as employment creation, reduction in transportation cost of cargoes within the country. In addition, the development of dry port will also reduce congestion, noise and pollution levels around the port and its vicinity.

- Banjul port should at regular intervals redefine its objectives to tackle emerging issues and keep pace with the volatility of the shipping industry. Set out clear cut strategies to enhance efficiency and productivity particularly ships turnaround time and container dwelling time in port through investment in modern infrastructure, superstructure and cargo handling equipment.

- The Government of the Gambia and the management of Banjul Port should also aim at establishing port clusters competitive port system, introducing free trade zones to attract companies, logistic service providers and other services, such as bunkering, shipbuilding, ship equipment and container maintenance. There is also need to strengthen the port’s
marketing strategy, creation of integrated Information Technology system such as e-commerce and on-line transactions with port stakeholders and partners. Maintain cordial relationship with local communities to address any environmental externalities that may ensue at the port and the coastline of the Gambia.

6.2.0 Research limitation

This research work looks at how the concept of dry port could be applied in the Gambia to decongest Banjul port. However, the financial viability and specific location of such a project is not covered in this work. Furthermore, the research does not represent the perspective of all port stakeholders directly and indirectly involve in the day to day operations of the port. This is mainly due to lack of enough resources to conduct an inclusive research which represents the views of all stakeholders. In addition, some responses from the generated questionnaire did not match the researcher’s expectation.

Nevertheless, the researcher believes that this research work has provided the basis for the Board of Directors and Management of Banjul Port to consider developing a dry port as a more sustainable and effective way of port capacity expansion compared to buying private properties.
References


Retrieved from https://www.tandfonline.com/doi/pdf/10.1080/03088830701848953


Appendices

Appendix 1: Consent letter

Dear Participant,

Thank you for agreeing to participate in this research survey, which is carried out in connection with a Dissertation which will be written by the interviewer, in partial fulfilment of the requirements for the degree of Master of Science in Maritime at the World Maritime University in Malmo, Sweden.

The topic of the Dissertation is “Developing a dry port to spatially increase and decongest Banjul port”.

The information provided by you in this interview will be used for research purposes and the results will form part of a dissertation, which will be published online and made available to the public. Your personal information will not be published. You may withdraw from the research at any time, and your personal data will be immediately deleted.

Anonymised research data will be archived on a secure virtual drive linked to a World Maritime University email address. All the data will be deleted as soon as the degree is awarded.

Your participation in the interview is highly appreciated.

Student’s name: Dawda Colley
Specialization: Port Management (PM)
Email address: w1802989@wmu.se

I consent to my personal data, as outlined above, being used for this study. I understand that all personal data relating to participants is held and processed in the strictest confidence, and will be deleted at the end of the researcher’s enrolment.

Name: Dawda Colley
Signature: ………………………………....
Appendix 2: Questionnaire

I am Dawda Colley, an employee of Gambia Ports Authority currently pursuing MSc Maritime Affairs (specialization Port Management) at the World Maritime University in Malmo, Sweden. Amongst the requirements for the completion of this program is dissertation writing. In light of this, I aspire to undertake a research that will help mitigate and improved on some of pressing challenges confronting Banjul port. This research intends to focus on the prevalent and persisting congestion at Banjul port which has a negative bearing on the businesses of port users. Numerous efforts have been made to decongest the port over the years amongst which include buying private properties to spatially expand the port, notably “terminal 22 in 2015”. However, the issue of congestion is still incessant at the port.

In order to have a medium and long term solution to this problem, I want to undertake a research titled “Developing a dry port to spatially increase and decongest Banjul Port”.

To achieve the intended objective of the research and have an inclusive perspective of all stakeholders, I hereby solicit your cooperation to complete the questionnaire provided herein.

Any information or data provided herein will be used exclusively for academic purpose and treated with utmost confidentiality.

<table>
<thead>
<tr>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Company/organization</td>
</tr>
<tr>
<td>Line of Business</td>
</tr>
<tr>
<td>Respondent Email ID (if any)</td>
</tr>
<tr>
<td>Date</td>
</tr>
</tbody>
</table>
Section A:

Respondents background information

Your Company/Organization main area of activity.

1. Please indicate which of the following choices best describes your organization? (if your organization performs more than one activity, select the one with highest volume/value).

☐ Shipping line   ☐ Freight forwarder   ☐ Clearing agent

☐ Cargo owner (importer/exporter)   ☐ Container trucking haulage servicer provider

2. Please choose the most appropriate; on average the number of vessels your organization/company called to Banjul port over the last five (5) years? (Applicable only to shipping lines).

☐ 1 – 20 vessels   ☐ 21 – 34 vessels   ☐ 35 – 45 vessels   ☐ Over 50 vessels

3. What type of cargo does your organization/company bring into Banjul port (if there is more than one main type of cargo, select the one with highest volume)?

Container ☐   Dry bulk ☐   Ro-Ro (freight & cars) ☐

Liquid bulk ☐

4. On average per year, how many container TEUs does your company/organization handle at Banjul port?

Less than 1,000 ☐   1,000 – 15,000 ☐   15,000 – 30,000 ☐   Over 30,000 ☐

5. On average per year, how many cargoes in metric tonnes does your company/organization handled at the port?

Less 24,000 ☐   4,000 – 120,000 ☐   120,000 – 240,000 ☐   Over 240,000 ☐
Section B

Challenges or quality level at Banjul port

6. Please indicate below for each sub-category the challenges (if any) your company/organization faces operating at Banjul port.

I. **Physical attributes** - refers to the geography, physical and/or infrastructural conditions of the port.

- Which of the following challenges affect your company/organization’s operations in relation to physical attributes of Banjul port? (Tick more than one box if applicable).
  - [ ] Limited depth of the access channel to the port
  - [ ] Lack of sufficient berth facilities
  - [ ] Inadequate or insufficient infrastructure
  - [ ] Insufficient or outdated handling equipment
  - [ ] Inadequate open storage capacity to meet the increase demand of container traffic
  - [ ] Insufficient foreland and hinterland connectivity
  - [ ] Others (please specify below)

- Please, comment on how these physical constraints of Banjul port affect your line of business. Provide suggestions or considerations on how the situation can be improved.
II. **Organizational attributes** – refers to the general port organization in terms management, cargo handling service and cargo storage services offered at Banjul port.

For each of the aforementioned organizational areas, you will be asked to describe issues affecting your line of business and potential solutions. (please tick in circle provide)

- **Port organization and management:** - Which of the following challenges relating to port organization and management is your organization/company confronted with?
  
  - [ ] Insufficient/lack of integrated information services (single window for information)
  - [ ] Insufficient/no synchronization of information systems with other ports
  - [ ] Insufficient coordination of the different port services
  - [ ] Insufficient supervision, control and monitoring of services provided by the port
  - [ ] Insufficient capacity to absorb traffic growth (congestion)
  - [ ] Others (Please specify in the space provided below)

  Please, comment on how these challenges affect the efficiency of your services and if the port’s management is working towards addressing these challenges. Present your considerations on how the situation can be improved.
**Organization of cargo handling services at Banjul Port:** - Which of the following challenges affect your company/organization’s performance in relation to cargo handling services offered at the port?

- Insufficient quantity and quality (in terms of availability, reliability, flexibility and speed of handling equipment)
- Insufficient container scanning service
- Lack of enough open storage capacity for container stacking
- Insufficient warehousing facilities
- Others (Please specify on the spaces provided below)

Please, comment on how the organization of cargo handling services at the port affects the overall quality of your business. Present your considerations on how the situation can be improved.
Organization of cargo storage services: - Which of the following challenges affect your company/organization’s performance in relation to cargo storage services at the port?

☐ Lack of enough open storage facility for containerized cargoes
☐ Insufficient handling equipment at container yards (lack of enough reach-stackers, trailer trucks, front-end loaders)
☐ Lack of segregation of container stacking per shipping line
☐ Lack of professionalism of port staff (operators, tally clerks, etc.) at container terminals
☐ Others (please specify on the space provided below)

Please, comment on how the organization of cargo storage services affects the overall quality of your company/organization’s services. Present your considerations on how the situation can be improved.
Section C

Please consider this section a general overview of my experience and observation over the past four years with regards to Banjul port operation and congestion challenges.

- Please indicate on a five-point scale your degree of agreement or otherwise on my observation of Banjul port operations and congestion challenges.

<table>
<thead>
<tr>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate berthing facilities for ship calling the port</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insufficient handling equipment for ship operation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of enough container stacking area/capacity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insufficient cargo handling equipment at quay &amp; yards</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Too many bureaucratic procedures for cargo clearing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obsolete and inefficient container scanning machine</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of efficient port foreland connectivity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port spatial expansion is constraint due its location</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developing a dry port at “Bund road” will ease port congestion &amp; provide much needed storage space.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The port need to invest in more ship &amp; cargo handling equipment.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The port need to provide more warehousing facilities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>There is need for a synergized information sharing among the port community members.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Banjul port has the potential to increase its throughput</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Section D

Please note that the statistics given herein are facts generated from the GPA monthly reconciled statistics. I as a member of the statistics reconciliation committee over the past two to three years have observed the following.

- Since the inauguration and extension of the storage capacity of the port in 2015, the proportion of containerized cargo to total throughput has steadily increased from 70% in 2015 to 74% in 2018.
- It is also observed that import container FCLs (full container load) from 2015 to 2018 has an average growth rate of 16%. In simple words, what this means is that containerized cargo handled at the port increases by 16% every year from 2015 to 2018.

With the aforementioned observations, I personally infer this growth to the increase spatial capacity of the port which induced more import FCLs. To efficiently maintain this trajectory and avoid saturated and congested container terminals, developing a dry port will be prudent. Furthermore, the location of the port impedes its need for spatial expansion. Therefore, the need for developing a dry port at Bund road is of essence.

- Please indicate on a five-point scale your degree of agreement or otherwise on the following.

<table>
<thead>
<tr>
<th></th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is developing a dry port a good option for reducing congestion at Banjul port?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Is developing the open area at Bund road into a dry port a good option towards this end?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Will the development of a dry port at Bund road help reduce road congestion within Banjul?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Will the development of a dry port at Bund road reduce the noise level within the port vicinity?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

If you have further consideration/suggestions, please provide below.
Section E

*Future development*

- How do you see the Banjul port developing in the next 5 – 10 – 15 years?

<table>
<thead>
<tr>
<th></th>
<th>Decline</th>
<th>steady development</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Next 5 years</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Next 5 to 10</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Next 10 to 15</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

Please indicate your expectation of the rate of this development and explain the main reason for the presumed development.

Thank you for cooperation, time and effort. For further communication, suggestion or advice on the topic, I can be reached on the following contacts.

Email ID: dawcolley@gmail.com
Phone number: +46769239342
Date: 19th/06/2019