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Analyzing the Dynamics of the Artisan Fishing Industry and LAPSSET Port in Lamu, Kenya

Valerie Rodden
SIT Study Abroad

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Abstract

The LAPSSET project has the potential to severely impact the artisan fishing industry in Lamu. Through the provision of a perception focused survey and a few one on one interviews with artisan fishermen and key stakeholders in the industry, this study creates a more comprehensive understanding of the relationship between the fishing industry and the LAPSSET project. The fishermen of Lamu are most concerned about the lack of communication concerning the port's activities and the blocking of fishing areas during port construction and operation. In general, there is a great sense of fear surrounding the port and the future of the artisan fishing industry. Incorporating the voice of the fishermen into the dialogue assists in addressing the many potential concerns of the port and the future of the artisan fishing industry.

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Acronyms

BMU	Beach Management Unit
CORDIO	Coastal Oceans Research and Development in the Indian Ocean
EEZ	Exclusive Economic Zone
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GOK	Government of Kenya
KES	Kenya Shillings
KFS	Kenya Forest Service
KMFRI	Kenya Marine and Fisheries Research Institute
KNBS	Kenya National Bureau of Statistics
KWS	Kenya Wildlife Service
LAPSSET	Lamu Port South Sudan Ethiopia Transport
MALF	Ministry of Agriculture, Livestock and Fisheries
MOT	Ministry of Transport
MP	Member of Parliament
NCC	North Coast Conservation
NEMA	National Environmental Management Authority
OSMAG	Oil Spill Mutual Aid Group
PMB	Port Management Board
R&V	Risk and Vulnerability
SWIOFP	South West Indian Ocean Fisheries Project
USD	United States Dollar
VTS	Vessel Traffic Control Systems
WWF	World Wildlife Fund

Introduction

The 200 nautical miles within Kenya's EEZ contain one of the country's most valuable renewable resources. The actors of Kenya's fisheries are mostly artisanal fishermen who operate small, un-motorized vessels within 5 nautical miles of the shoreline. There are 4,800 registered vessels on the coast and cumulatively they produce 6,000-7,000 million tons of fish a year. The fruits of their labor are worth 500 million KES, or 5.76 million USD (State Department of Fisheries, 2013). Given estimates that the marine fisheries in Kenya have the potential to generate 1-2 billion USD annually (Kabubu and Mwako 2014), Kenya's marine fisheries are only reaching .5% of their potential. This isn't too surprising considering the 195 nautical miles of marine resources currently being underutilized by the artisan fishing industry.

While the fishing industry seems miniscule in national economic terms, it is much grander in terms of the coastal communities who are sustained by the industry. In Lamu County, marine fisheries comprise 75% of the local economy (Mbungu 2014) and it has been the main livelihood strategy for generations. Fishing is the primary occupation for 89% of Lamu households with mangrove harvesting, small scale farming, and tourism providing the additional income (MOT 2011, 133). Holding a population of 101,539 people (KNBS 2010), approximately 80% of the community's livelihoods are dependent on fisheries and marine resources (WWF Norway 2011, 14).

In the coming years, the Lamu Archipelago in Kenya's northern coast will be experiencing dramatic structural changes. The 24.5 billion dollar LAPSSET (Lamu Port-South Sudan-Ethiopia Transport) project officially started in March 2013, and if construction stays on schedule it will be completed by 2030. The ambitious project includes a 32 berth port, railway line, highways, multiple airports, tourist resorts, and an oil pipeline (Shippers

Council of East Africa 2013). Projections show that the LAPSSET project will add 2 to 3 percent to Kenya's economic growth in addition to creating employment and reducing poverty levels in the country (MOT 2010).

The outlook for the artisan fishing industry is not as optimistic. As David Leadbeater concludes in his study on single industry resource communities, "Globalization breeds productivity but an issue is how the benefits and costs of productivity gains are distributed" (2009, 95) The port is going to increase Kenyan GDP by 2-3% and it's going to increase trade and allow development in the Lamu archipelago, but how many Lamu citizens are going to benefit from these economic gains? Leadbeater argues that labor and communities are often forced to carry most of the costs of these development projects while being denied most of the benefits (2009). Three of the seven most productive fishing areas in Kenya are located in the Lamu archipelago. Two of these areas, Kizingitini, and Faza, are located on the north Coast of Pate Island and the third area, Kiunga, is just north of Kiwayu (State Department of Fisheries 2013). The construction and activity of the 32 berth port will disrupt the livelihoods of the fishermen working in these highly productive fishing areas. Current fishing areas will be reclaimed for port activity, as is already occurring in Manda Bay, to make room for port activities and movement of vessels (MOT 2010, 280). Dredging and construction will restrict access to many fishing areas and increased boat traffic increases risk of accidents which are especially dangerous for the smaller vessels that artisan fishermen use. (MOT 2011) The boats and techniques used by the artisan fishermen are not equipped for deeper waters so moving out of the port area is not currently an option.

Area of Study

Lamu is a district in Kenya's coastal province comprised of a collection of islands covering an area of 6,273.1 square kilometers. The town of Lamu, over 1000 years old, is the

oldest Swahili settlement in East Africa and Islam and Swahili culture continue to have a strong presence throughout the islands of Lamu (Ridwan 2011). The Lamu islands served as a trading post between East Africa and the East from the 9th century and continued to strengthen and grow until the 18th century. Throughout those years there were invasions by the Portuguese and then the Omani Arabs, causing violence and turmoil, yet still increasing trade and influence within Lamu. The end of the 18th into the early 19th century brought with it the Mombasa port, the Uganda railway, and the abolition of slavery; all contributing to the decline of the old Lamu port and it's strong economy (Kabiru 2014, 2).

Shortly following Independence in 1963 a governmental settlement program transplanted Kenyan's of the Kikuyu tribe from the mainland to the Lamu archipelago. The Kikuyu have been living and working with the local Swahili people for the past 40 years, yet tension still arises due to cultural differences and land rights discrepancies. While most of the local Swahili people do not have title deeds and are considered squatters on their homeland, the Kikuyu people were given land titles by the government upon their resettlement in the 1970's. The growth in the tourism industry since Independence has led wealthy Kenyans, Europeans, Americans, Arabs, and people from every corner of the world to visit and settle in Lamu. There was a decline in the tourism industry following the post election violence in 2008 (Kabiru 2014, 8). The attention from LAPSSET has increased tourism levels again, and renewed interest in the real estate of Lamu, with a combination of government figures and foreigners rushing to purchase the rights to the valuable land.

The population was last recorded in 2009 at 101,539 but this is expected to rise exponentially as the LAPSSET project brings in laborers, tourists, and other interested individuals. Currently the main forms of economic activity are fishing and agriculture, but tourism is continuing to grow in strength as well. A majority of Lamu citizens continue to

live in rural areas with only about 10% residing in towns (Laher, 2011). Lamu Old Town was listed as a World Heritage Site by the United Nations in 2001 and continues to hold that status today (Kabiru 2014, 4).

Statement of the Problem

There is no succinct resource bringing together the current happenings of the fishing industry and the role that LAPSSET has within this industry. The Report on Biodiversity and Conservation on Pate Island highlights some reasons why this might be the case:

> "There are many threats to the conservation and management of the area which can be summed up as: poor governance, a sectoral approach to resource management, a lack of community access and participation in decision making, lack of access to environmental information for local communities, lack of legal remedy and land tenure insecurity. Consequently the management o f the coastal and marine environment in this area is piecemeal and inadequate. The proposed Lamu Port in the channel between Manda and Pate islands w ill have severe environmental consequences" (Samoilys, Osuka, and Maina 2011b, 1).

In 2010 a feasibility study for the LAPSSET project was completed by the Ministry of Transport and the Japan Port Consultants of Tokyo. In 2011 The Ministry of Transport conducted an Environmental Impact Assessment Project Report for review by The National Environmental Management Authority (NEMA). Both of these reports discuss the instrumental role of the fishing industry in the Lamu archipelago, the possible impacts that the port could have on the industry, and mitigation measures to limit the negative impacts. However, in neither report is there a sufficient analysis on the fishing industry. Despite the long list of relevant agencies that have completed reports on the fishing industry in the past, none of them have made an effort to do a comprehensive analysis on the fishing industry in light of the LAPSSET project. These agencies include: The Ministry of Agriculture, Livestock and Fisheries (MALF), South West Indian Ocean Fisheries Project (SWIOFP), Fisheries and Aquaculture Department of the Food and Agriculture Organization of the UN,

World Wildlife Fund (WWF), Kenya Marine and Fisheries Research Institute (KMFRI), Coastal Oceans Research and Development in the Indian Ocean (CORDIO).

There is also a gap in policy surrounding the fishing industry. The Coordination Secretariat for the LAPSSET project published a document with a list of policies that currently exist and are being implemented concerning the project. The policies listed are Kenya Vision 2030 Strategy, Water Policy; Housing Policy; Energy Policy and Roads Subsector Policy of 2006, Integrated National Transport Policy and Information and Communications Policy (Kasuku 2012). No policy concerning fisheries, local industries, or local economic stability is currently being considered. The Fisheries Act Cap 378 states that any development that interferes with fish landing beaches or displaces fishermen from their traditional fishing grounds can be challenged if it is not supporting the development of sustainable fishing in the coastal waters (GOK 1989). However, this policy has yet to be enforced upon the LAPSSET project.

Among the concerns surrounding the port are land ownership issues, destruction of mangrove trees, loss of culture and traditions and alteration of traditional livelihoods. Many community based organizations and committees have been working to represent the communities concerns. Save Lamu, a strong local nongovernmental organization, focuses on preserving the environmental and cultural assets of Lamu. A LAPSSET steering committee, the Muslim Youth Association, and community representatives from other local organizations have been working together to initiate local engagement with the project (Opiata 2013). Missing from the dialogue are the voices of the fishermen in Lamu and adequate representation of their concerns.

The artisan fishing industry is the most significant source of livelihood, food security, and economic growth for the people of Lamu. It has been noted that there is poor quality of

information being transferred between the fishermen of Lamu and the policy makers of Kenya. While information is usually collected for large scale commercial purposes, the artisan fishermen that produce the bulk of what is consumed, are not given the same kind of attention because it is more technically difficult to gather that information (FAO 2012). The livelihoods of thousands of fishermen are in danger due to the port's activities, yet mitigation actions are not yet being seen.

Purpose of this Study

This study seeks to create a community based impact assessment of the LAPSSET project on the artisan fishing industry in Lamu. In response to the missing voice of the fishermen in relevant literature and their generally limited role in port planning and construction, a community based research design is deemed useful and necessary. Aligning with the 8 key principles of community based research (Israel, Schulz, Parker, Becker 1998) this study seeks to:

1. Recognize the unique conditions of the Lamu archipelago and the 35+ villages within it
2. Build on the work of the Beach Management Units (BMU) and utilize their resources to better reach the communities
3. Facilitate collaborative partnerships with Save Lamu and the Ministry of Fisheries during the interview process and publication
4. Integrate knowledge and action for mutual benefit through increasing the dialogue surrounding artisan fishing industry in Lamu and provoking action from key stakeholders
5. Promote a co-learning and empowering process through inclusion of the artisan fishermen in the dialogue and final report
6. Involve a cyclical and iterative process by adjusting interview questions in response to community members opinions
7. Address the industry through both an economic and people centered perspective
8. Disseminate finding and knowledge to Save Lamu and the Ministry of Fisheries, in addition to making it available upon request to any interviewees and contributors

Using these 8 principles as a guiding tool, this study seeks to highlight the dynamics of the artisan fishing industry and the impending port. The impact study provides baseline information on issues and trends of the artisan fishing industry that may be affected by the development of the LAPSSET project. Specifically, the study analyzes each of the issues raised by the fishermen in relation to their potential impact, project phase, risk level, potential mitigation strategy and agents responsible. Complementing the impact study is an informal risk and vulnerability assessment, adapted from Bendokat and Tovo (1999) that highlights the natural, social, and economic factors that affect the risk and vulnerability of the Lamu fishing industry.

An understanding of the structural foundations of the fishing industry and fishing community is necessary for appropriate analysis of the prospective effects of the port. Preliminary research highlighted the vulnerability of the Lamu community so an R&V assessment seemed appropriate. Taking into consideration both the LAPSSET project and the structural complications of the industry provides a more holistic assessment of the future of the artisan fishing industry.

Research Questions

1. In what ways could port activity be in conflict with the livelihood of artisan fisherman?
2. Where and to what extent will current fishing waters be taken over by port activities?
3. If current fishing grounds are no longer available, where would the local fishermen relocate or what actions would they take to move forward?
4. Are fisherman currently preparing for the incoming port? In what ways?
5. What perceptions and expectations do fishermen have for the new port?

Overall Objective:

This study seeks to understand the dynamics of the Lamu artisan fishing industry and the LAPSSET project.

Specific Objectives:

1. Determine direct and indirect beneficiaries of the artisan fish industry
2. Identify the areas around the Lamu Archipelago that could be contentious space for the fisherman and the Port's prospective activities
3. Obtain the Lamu fishermen's perspective on the LAPSSET project
4. Identify options of action for the artisan fishermen

Literature Review

Ministry of Transport (MOT)- LAPSSET Corridor and New Lamu Port Feasibility Study and Master Plans- 2010[1]

This report served as a key resource in constructing interview questions concerning specific components of the port construction. It also highlighted the neglect of the local fishing communities. One of the five objectives under the LAPSSET Corridor Feasibility study is to "undertake a full technical, economic and financial feasibility study on the development of the proposed port" (1). However, the report fails to acknowledge the feasibility of the project in terms of the local population. In the section on socio-economic conditions and potential of corridor area, there is only macro economic data while the local conditions are ignored (4). Under a section focused on the Lamu District, it is stated, "one of the main economic activities in the islands is fishing" (16). Interference with the fishing

[1] This report could only be found in the documents section of SAVE LAMU's website. The GOK has not made it widely available to the public.

industry is referenced throughout the document, however the section called “Impacts on Fisheries”, is only a few paragraphs long and details are spared (274).

The report serves as an extremely useful resource for a comprehensive understanding of the port’s activities and repercussions. There are a plethora of potential issues for the fishermen mentioned in this document as well as prospective “social mitigation measures” to alleviate the negative effects. However, the information is scattered within a 1,683 page document so a comprehensive relationship between the port and the fishing industry is not easily understood.

Ministry of Transport (MOT)- Environmental Impact Assessment Project Report- 2011

Reading this report was an integral step in deciding to conduct a study focused on the fishing industry. In general, this report relays an extremely optimistic analysis of the port’s activities and skims over the impacts concerning the fishing industry. The section titled “Economic Value of the Fishery” consists of one paragraph and concerns only the spiny lobster fishery (138). There are no actual economic values provided and the remaining sectors of the fishing industry are completely neglected. The only effects for fisheries mentioned are negative externalities from dredging activities (163) and an economic boost for the fishing industry due to the possible construction of 2 fishing ports (32). The gaps in this impact assessment show the need for a separate assessment focused solely on the fishing industry.

This report also claimed that the community was in support of the project through their statistic that 85% of respondents stated that the port construction would benefit the local community. However, this was in response to a specific component of the project, the opening up of the area through the construction of a tarmac road, and the respondents may not have been representative of the population (161). This shows the importance of

incorporating the true opinions of the average Lamu citizen in analyzing sentiments toward the port.

Kenya Marine and Fisheries Research Institute (KMFRI)- Annual Report- 2010/2011

This report was extremely useful in providing a background on current issues and happenings within Kenya's marine and fishery industry. Specifically relevant was project two of the report, a socio-economic research program concerning global markets and the livelihoods of coastal communities. The purpose of this project was to study community vulnerability in response to emerging issues such as climate change, and the ability of the community to cope and adapt to these issues. This project seemed extremely relevant to the LAPSSET project, yet there was no direct reference to LAPSSET as Lamu was not one of the five sites chosen for the study.

One of the specific issues mentioned was the competition for prime land surrounding present fisheries which are leading to a loss of beach access routes by fishers. Construction of tourist hotels along the coast, operations of private individual outside the community, and large scale marine exploitation projects were all mentioned as relevant coastal activities that are prohibiting locals from accessing their resources, yet Lamu and LAPSSET were not mentioned. Considering the magnitude of the port project, and the obvious effects it will have on Kenya's Marine and Fisheries, it deserves attention in a relevant and current report such as this one. This was the last Annual Report published so its possible KMFRI stopped publishing reports and hasn't been able to address the LAPSSET project in the past 3 years. Regardless, there is a need for relevant agencies, similar to KMFRI, to address this topic.

Guy Wright and Christian Pyke- Fishing Industry Impact Study: James Price Point Proposed Liquefied Natural Gas Precinct- 2009

The framework for the impact assessment of the Natural Gas Precinct was instrumental to the creation of the impact assessment in this study. The tables used to present the impact data are borrowed from this study. The decision to model the impact analysis after the analysis in this study stems from the similar data collection process and relevant topic of study. One-on-one interviews with fishermen and key stakeholders are the principle method of data collection for both projects. This was the best method of analysis for qualitative and anecdotal data that could be found and the fact that it is a Fishing Industry Impact Study made it even more relevant to the study at hand.

Risk and Vulnerability Works

-Vulnerability as Viewed from Different Disciplines 2002: This document was extremely useful in understanding the concept of vulnerability as applied to communities and households. “Everyone faces risks, and some people are vulnerable because of their inability to manage these risks - due to a lack of assets and other factors” (10). Considering the small value of assets, low income levels, single industry dependence, and depletion of fish stocks that are characterizing the artisan fishing industry, an analysis on the risks and vulnerability of this population seemed useful.

-Risk and Vulnerability Analysis in World Bank Analytic Work 2008: The idea of an R&V analysis was solidified after learning about the connection between risk and shock and the importance of risk management strategies in dealing with a shock. Considering the LAPSSET port as a potential shock to the fishing industry, an already vulnerable population, fit well into this framework.

-Guidelines for Assessing the Sources of Risk and Vulnerability 2002: Within this document, tools for completing an R&V analysis were borrowed and adapted to fit the artisan fishing industry in Lamu. Specifically, the graphic for the R&V assessment in this paper is modeled after a risk assessment exercise on the risk factors in Togo (49). Useful actions for the mitigation of risk in the fishing industry were also influenced by the guidelines in this study.

Methodology

The Fishing Industry impact assessment was based primarily on survey results from artisan fishermen and key stakeholders in the fishing industry. A copy of the artisan fishermen survey can be found in Appendix 4. In addition to the surveys, there were several key informant interviews and a thorough literature review to validate and compare data collected through the surveys.

Sampling Strategy

The surveys were administered to 13 local artisan fishermen and 10 key stakeholders over a period of one week (April 16-April 22) in 8 different villages. The survey population was all artisan fishermen and key stakeholders operating in Lamu, Kenya. Key stakeholders consisted of BMU officers, a local chief, an officer for the State Department of Fisheries, fish dealers and traders, a WWF technical assistant, and a coordinator from North Coast Conservation (NCC) project on Pate Island.

The first set of surveys was distributed to community members of seven villages on Pate Island during a meeting with Save Lamu. The seven villages were Tchundwa, Shanga Shikani, Faza, Kizingitini, Pate, Siu, and Shanga Rubu. The sampling frame consisted of individuals in the population who attended the Save Lamu meeting and had a relation to the

fishing industry. The second set of surveys was given to fisherman found on Manda Island during a day trip with a fellow researcher. A snowball sampling technique was used because the target population was non static and not prevalent in Manda Maganga village. The third set of interviews was administered to Lamu fishermen and fish dealers on Lamu Island. The sampling frame consisted of individuals operating on the sea front during the time of administration and a snowball sampling technique was used again. The final set of surveys was distributed in Kiunga, Faza, and Kizingitini villages and the sampling fame consisted of individuals who stopped by their local BMU or Fishing Cooperative office during the time of data collection.

Data Collection and Analysis

The surveys were administered orally and a translator was always present. While a translator was necessary for a portion of most of the surveys, there were a few surveys completed without the help of a translator. The data was collected on paper and later inserted into a Google generated survey. The results from the survey were automatically imported to Microsoft Excel where the data could be aggregated and analyzed.

The key informant interviews were done with the County Director of Fisheries in Lamu County and the chairmen of the Amu BMU. In addition to the interviews, information was pulled from conversations and events with community members throughout the period of research.

Most of the relevant information was qualitative information, so analysis was done through conversions into frequency. The impact assessment graphic was created from categorizing open ended answers into quantifiable items. The prevalence of a category decided whether it was included in the assessment. Through direct communication with the

fishermen and stakeholders, potential issues and mitigation options were discovered that a more formal quantitative survey may have neglected.

Limitations

There were several limitations encountered during this study that could be improved upon in future work. The greatest limitations were the short time period allocated for data collection and a lack of funding to conduct the research. It limited the number of surveys conducted and the locations reached. Interviews were only conducted in 8 villages so specific concerns from villages not selected for the study are being neglected. A larger sample size of fishermen and stakeholders would allow more accurate and reliable data analysis to be completed. The language barrier was another limitation because exact translation is not always possible and there is a chance of bias from the translator.

An inability to access certain documents and sources of information was another limitation encountered during this project. Though an Environmental Impact Assessment was completed for the LAPSSET project, it was not possible to obtain a copy of this document. The inability to reference this relevant document could lead to inaccuracies in the present project. County statistics, beyond basic population data, were also difficult to acquire. Official statistics concerning Lamu County could not be found from KNBS or any official GOK source so several statistics were pulled from newspaper articles and other secondary sources.

Analysis and Results

The results are presented in two parts. In Part 1, *Analyzing a Vulnerable Industry*, the structural complications of the fishing industry are explained. An informal R&V assessment

is presented to provide a glimpse into the current state of vulnerability the fishing industry is experiencing. Understanding the vulnerability of the industry is fundamental for an accurate impact assessment of the LAPSSET project. In Part 2, *Determination of Potential Impacts and Mitigation Plans for the LAPSSET Project*, a community based impact assessment is presented and discussed. Issues raised by fishermen and stakeholders were analyzed against their potential impact, project phase, risk level, potential mitigation strategy, and agents responsible.

Part 1: Analyzing a Vulnerable Industry

Vulnerability is caused by multiple sources of risk and the inability to manage these risks (Alwang, Siegel, Jorgensen 2002). The survey results and interviews make it evident that the fishing industry in Lamu suffers from a plethora of risks, both historic and current. Here, risk is defined as potential fluctuations in the circumstances of an individual which affect its income and/or welfare. In particular, risk refers to states of the world that an individual faces, coupled with the likelihood that each of these states will occur (Kozel, Fallavier, and Badiani 2008). In this analysis, the risks within the Lamu fishing industry are evaluated in relation to the well being of the industry and the community in addition to the individual analysis. The risks are organized by three groups of causal factors: natural, social/geographic, and economic/ political. The risk factors and there outcomes are organized in figure 1.

Figure 1: Lamu Fishing Industry Risk Assessment

	Risks	Individual Level Outcomes	Industry Level Outcomes	Community Level Outcomes
Natural Factors	**Depletion of Fish Supply**	Less productive work; fish caught per hours worked will decrease	Forced relocation to new resource areas	Economic activities will diminish with the productivity of the fishermen
	Seasonal Weather Patterns	Less frequent work during rainy seasons	Activites slow down; less productive	Energy focused on farming when fishing is not possible
	Diseased/Unsafe Fish	Illegal to fish so Temporary Unemployment	Industry is shut down; small illegal activities may persist	No fishermen income to stimulate economy so flow of economic activities is halted
Social and Geographic Factors	**Low Education Level**	less opportunities	lack of mobility or progress	economic stagnancy and smaller job market
	Isolated Geographic Locations	Only local job opportunities; difficult to aquire inputs for fishing	Organizations/ Unions are not easily formed; industry wide action is hindered	Difficult for information to reach individual villages
	Lack of asset building tools	Financial instability	Temporary unemployment or shocks to the industry are devestating for laborers	Savings methods are not practiced and loans are not available
Economic and Political Factors	**provides income for 80% of the population**	Livelihood either directly or indirectly dependent on the fishing industry	Abundant supply of labor and tragedy of the commons	Resource-reliant communities have an economic necessity to
	No licenses for legal exports	No reason to go for larger catch in the deep sea because no demand for it in local market	No access to global markets stagnates industry growth	Lack of upward growth in the community
	Poor Industry Infrastructure	Profits are diminished due to higher exchange costs; inability to operate in deeper waters	Forced to import basic inputs (ice,gear) and export for mass production (packing and storing facilities); Can't capitilize on rich marine	Industry related job opportunities are scarce
	Lack of Representation in Government	Minimal information shared between individuals and government bodies	Industry doesn't receive adequate funds to increase efficiency or productivity	Community's concerns are ignored and neglected

Table adapted from Bendokat and Tovo, 1999, p.6. "Risk Factors in Togo"

Natural Factors

The risks caused by natural factors are depletion in the fish supply, seasonal weather patterns, and diseased or unsafe fish. A depleting fish supply was mentioned by the County Director of Fisheries as an imminent concern. The increased number of fishing boats and larger catch yields has placed an increased demand on the fishery stock and depleted the resource dramatically in recent years. This is not sustainable behavior, and eventually the stock will deplete to the point that fishermen become less productive and are forced to relocate to a new resource area. There are 195 nautical miles for them to move into; however fishermen are not using the mechanized vessels necessary for accessing the deep waters. 100% of the fishermen responded negatively to the survey question, "If you were forced to relocate to deeper waters would your current boat and equipment be sufficient to continue fishing?" This leads to the conclusion that a depletion of fish stock is a high and immediate risk for the artisan fishing industry.

The seasonal weather patterns dictate when fishermen can work. The northeast monsoon and southeast monsoon seasons are influenced by trade winds that control the weather and ultimately fishing patterns. (Maina 2012, 31) The Southeast Monsoon season usually lasts from May to August and is characterized by strong winds and rough seas. This is a risk to the fishing industry due to the lack of predictability concerning the length of time Monsoon season will persist and the inability for many fishing vessels to operate during this season (Maina 2012, 20). When fishermen are restricted by the seasonal weather patterns community energy is shifted to farming and other forms of income generation. However, several survey responses specifically stated, "fishermen are fishermen and farmers are farmers". In the most

recent frame survey[2] for Kenya fisheries only 13 of 2,880 fishermen claimed to participate in farming activities (Fisheries Department 2014). Shifting to agriculture for a few months a year is not a suitable solution for most fishermen in Lamu.

Diseased and unsafe fish is a less frequent issue, none the less it is a real risk that fishermen in Lamu are forced to consider. The Ministry of Fisheries has the ability to completely prohibit all fish industry related activities: catching, buying, or selling. The Lamu County Director for the Ministry of Fisheries explained that the Ministry is forced to take this action when fish stocks are deemed unsafe to the community due to widespread disease of the fish or pollution of the waters. When these fishing bans are put in place thousands of Lamu residents are put out of work and the local economy nearly comes to a halt. The income of fishermen stimulates the economy. Without the stimulus there is no need for local shops and markets to open up because there is no money to pay for the products.

Social and Geographic Factors

The Lamu community suffers from many socio-geographic issues but the most relevant to the fishing industry are the low education levels, isolated geographic location, and lack of asset building tools. Low education levels have been plaguing the Lamu community since Independence. The 2011 County Fact sheet shows that the Lamu Population with secondary education is 3% below the national average and the population with primary school education is slightly below the national average as well. Children between the ages of 15-18 who are attending school are only 64.7% of the population compared with the national average of 70.9% (Commission on Revenue Allocation 2011). Hussein Miji, the son of a local Shanga village fisherman describes the fishermen predicament as, “Education of the sea but no

[2] This report has not been officially released by the Fisheries Department. An officer in the Statistics section was able to provide a copy of the unpublished data for the benefit of this study

formal education". For the fishermen, the risk of low education levels mean fewer opportunities for upward movement in the industry. The industry itself suffers from lack of technological progress and growth. WWF Training sessions for the BMU units were deemed unsuccessful partly due to the low literacy levels of the BMU officials and members (WWF 2011, 9). While the community suffers from fewer job opportunities and a flooding of the fishing labor market due to the lack of alternative livelihoods.

The Lamu archipelago consists of many small islands off the coast of Mukowe, Kenya. Transportation between the islands is difficult and expensive for many of the local community members. Transportation to neighboring villages within each island is also an issue due to the lack of motor vehicles and poor road systems. The isolated nature of Lamu communities is a risk for the fishermen because it renders input accumulation and the selling of fish both difficult and expensive. The fishing industry is hindered from creating strong organizations and unions due to the geographic situation. The Beach Management Unit (BMU) structure is attempting to provide structure to the industry but it is suffering from the geographic realities. There are 39 villages within Lamu that have BMU sites[3], but only 19 of these BMUs are registered with the Ministry of Fisheries (Fisheries 2014). The remaining BMUs have not met the requirements to be acknowledged by the government. The isolated geographic location of Lamu villages is an immediate and relevant risk for the fishing industry.

A lack of asset building tools is a societal factor rooted in religious beliefs for the Lamu community. Outside of Old Town on the Lamu Island, there are no banks or savings and loans institutions available. A local Kizingitini fisherman explained that the lack of these institutions is partly due to the Islamic belief that owing money or paying interest is not

[3] See Appendix 1 for List of all 39 BMU sites provided by the County Director of Fisheries, Simon Komu

acceptable behavior. The low income nature of the communities and isolated geography are other factors contributing to the lack of banks. On an individual level a lack of assets causes financial instability. A fisherman is forced to live from hand to mouth so everyday he must sustain his activities if he wants to feed himself and his family. The income levels for the fishermen surveyed can be seen in the table below[4].

Monthly Income Rates

	KES	USD
Average	34,065	391.34
Median	14,000	160.83
Min	1,450	16.66
Max	200,000	2,297.60

Savings are not possible or encouraged so loans are not available to fisherman when they need it. When equipment breaks there is no source of funding available to fix it, and without assets there is no source for investment in new technologies or equipment so the industry does not progress forward.

Economic and Political Factors

The most prevalent risks to the fishing industry logically fall into the category of economic and political factor caused risk. The risks assessed here are the reliance of 80% of the population, lack of licenses for legal export, the poor industry infrastructure and the lack of representation in government. The statistic that 80% of the Lamu population relies on income from the fishing industry depicts the strength and magnitude of the industry. However the magnitude of this industry in the local economy is a huge risk because heavy reliance on a single industry makes an economy vulnerable. Especially when this industry is inherently vulnerable due to a lack of assets and technological inputs (Alwang, Siegel, Jorgensen 2002).

[4] Most fishermen had trouble providing their monthly income due to extreme fluctuations in daily income. A larger sample size is necessary for better estimates.

Single industry communities usually have other supporting businesses and industries that provide goods and services as inputs to the primary industry. The situation in Lamu is slightly different because many of the inputs have to be imported from Mombasa so there aren't even jobs available in supporting industries. Outside of fishing, there are laborers who provide consumer goods and services for the fishermen and employment in these supporting industries is completely dependent on the fishing market (Leadbeater 2009). If fisheries are harmed then the providers of goods and services will diminish as well because there will be less demand for these goods and services.

Currently, the fishing industry is being stunted by its inability to export fishing products. The fishermen in Lamu are not licensed for legal exports so the furthest their catches travel is Mombasa. There is not a huge demand for large fish or large amounts of fish in the local market so the fishermen have no encouragement to work outside of the reef where more productive yields can be obtained. This risks overexploitation of the inner reefs and discourages technical innovations and improvements in vessels and gear. It follows that the lack of access to global markets stagnates industry growth and stunts progress and growth in the communities as well. While capture production of fisheries has increased from 135 398 in 2008 to 181,418 in 2011 the value of exports have steadily decreased from 75,682 (in 1,000 USD) in 2008 to 54,778 in 2011 (FAO 2011). A technical assistant with the WWF explained in his survey response that the Ministry is currently working on acquiring certificates to export tuna, octopus, and lobster but results have not been seen.

Inadequate industry infrastructure is one of the most detrimental risks to the fishing industry. Included in the industry infrastructure that is lacking are the input industries, production facilities, modern vessels and equipment for deep sea fishing. Currently, basic inputs like ice are imported from Mombasa, an incredibly inefficient and expensive process.

Fishermen are forced to pay a high price for ice and there are frequent shortages which can destroy an entire days worth of work. An ice making plant funded by the Ministry of Fisheries was constructed in Faza village but the technology is so inefficient that the prices being charged are more expensive than the ice being imported from Mombasa[5]. Packing and storing facilities are also not available in Lamu so the catch needs to be immediately sold for transport to Mombasa or local dealers. Profits for the individual fishermen are dramatically diminished due to the high exchange costs. The lack of infrastructure for deep sea fishing also contributes to smaller wages and stunted growth in the market. Without the necessary infrastructure fishermen are restricted to the inner reef where fish stocks are being depleted and competition is high.

The fishermen also suffer from a lack of governmental representation. The MP Representative for Lamu County, Mr Julius Kariuki Ndegwa, is not a native of the area and has no ties to the local fishing communities that compose most of Lamu (Babo 2013). Local representatives struggle to connect the community members to the national government. There is minimal information shared between individuals and government bodies. The surveys portrayed a strong need for government intervention and aid to the local fishing industry, yet the fishermen did not have the information or resources to connect to the government bodies and express their concerns. The lack of representation leads the fishing industry to receive inadequate funds in budget allocations. This lack of funds leads to many of the infrastructural and market issues that were discussed earlier.

Key Findings from Risk Assessment

The fishing industry in Lamu suffers from a number of pertinent risks. The severity of each risk when compiled with the other risks creates a highly vulnerable industry.

[5] Images from the inactive ice plant can be found in Appendix 6

Considering the vulnerability of the fishing industry is necessary for the determination of impacts from the LAPSSET project. A shock to a vulnerable industry can be extremely damaging and the construction and activities of the LAPSSET project will definitely be a shock to the industry. The risk assessment will also be useful in analyzing the potential benefits from the LAPSSET project as the project has components that could mitigate the risks currently plaguing the industry.

Part 2: Determination of Potential Impacts and Mitigation Plans for the LAPSSET Project

Construction of the Fishing Industry Impact Assessment was based primarily off of the survey and interview responses. All of the Issues mentioned in this study were raised by the artisan fishermen or key stakeholders. Many of the potential impacts and mitigation strategies were deduced from the survey responses as well. The information presented in the study was then solidified by research of relevant documents and other secondary sources. The risk level was calculated by the percentage of individuals who mentioned the issue in their survey responses. The impact assessment graphic is organized by risk level but the discussion that follows will be organized by Issue Themes. Figure 2: The Impact Assessment can be found below.

Figure 2: Fishing Industry Impact Assessment

Issue Raised	Potential Impact	Project Phase	Risk Level	Potential Mitigation Strategy	Agents Responsible
Lack of Communication with the Community	Fishermen don't feel ownership to the port and they can't make well informed opinions or decisions	Planning and Construction	60.87%	Community and Industry Meetings to help with information sharing. Consult community members for advice and opinions concerning port activities. Write MoU (Memorandum of Understanding) to the government	LAPSSET Steering Committee, BMUs, Ministry of Fisheries
Port Construction blocking Current Fishing Areas	Fishermen will no longer be able to fish or they will be forced to relocate; causing overuse and crowding in other fishing areas	Construction	56.52%	Designate specific areas as fishing areas for the local fisherman. Provide alternative space for fishing activities. Protect key areas through conservancy projects	Ministry of Fisheries, WWF, North Coast Conservation
Lack of Equipment for deep sea fishing	Fishermen are limited to activities in the inner reef; port activities make inner reef activities difficult but fishermen are not capable of moving to deep sea	Construction and Operation	34.78%	Provide fisherman with capacity for deep sea fishing through provision of deep sea vessels, technology (gps and fish finders), and fishing gear. Financial allocations for these purposes	Ministry of Fisheries, BMU's and Fishing Cooperative Societies
The large container ships will make it dangerous for small boats to sail	Most fishermen are using canoes, dhows, and small motor boats; they risk being sunk and destroyed by larger ships if they continue operating	Operation	34.78%	Special shore based radar and radar reflectors will be installed for safe navigation and collision avoidance	LAPSSET Corridor Management Board, Ministry of Fisheries
Dredging will disrupt coral reefs and mangroves	Coral reefs and mangroves provide habitat for fish and other marine organisms; destroying their habitat will deplete fishing stock	Construction	34.78%	Protect key ecosystems through establishment of conservation zones; Develop plans for restoration, reconstruction and afforestation of the mangrove and coral reef ecosystems that will be destroyed	North Coast Conservation, Ministry of Forestry and Wildlife, WWF, NEMA, KWS, KFS

Figure 2: Fishing Industry Impact Assessment (Continued)

Issue Raised	Potential Impact	Project Phase	Risk Level	Potential Mitigation Strategy	Agents Responsible
Large container ships will attract sharks into the port	Increased chance of injury and death for lobster divers; It will be too dangerous for them to continue their activities	Operation	30.43%	Provide divers with safety equipment and gear to mitigate injury; Set up satellite and acoustic tagging programs to monitor general shark activities and whereabouts	Ministry of Fisheries, BMU's and Fishing Cooperative Societies
Negative externalities associated with oil transport	High risk of oil spills that would destroy local marine ecosystem, deplete fishing stock, and damage fishing industry	Operation	17.39%	Develop emergency contingency plans; Establish reporting and alerting mechanism to ensure prompt reporting of spillage; invest in specialized oil spill response equipment	Ministry of Forestry and Wildlife, WWF, NEMA, KWS, KFS
Lack of Training for Deep Sea Fishing	Difficult and dangerous for fishermen to leave the inner reef; being forced into deeper waters could lead to unnecessary accidents and death	Construction and Operation	13.04%	Government sponsored training sessions to prepare fishermen for deep sea fishing and alternative livelihoods in the port industry	National Government of Kenya, Ministry of Fisheries
Closing of Mkanda Channel will prohibit transportation	Traveling to and from Lamu East and Lamu West will be difficult; Limited access to fishing inputs and certain fishing areas	Construction and Operation	8.70%	Re-evaluate whether the closing of the Mkanda channel is necessary and appropriate; Establish alternative routes for travel	National Government of Kenya, LAPSSET Corridor Management Board

Adapted from Wright and Pyke 2009: Fishing Industry Impact Study- James Price Point Proposed Liquefied Natural Gas Precinct

Themes

1. ***Contentious Areas*** : Port construction blocking current fishing areas, Disruption of coral reefs and mangroves through dredging, and the closing of Mkanda Channel
2. ***Lack of Preparation*****:** Lack of communication with the community, lack of equipment, and lack of training
3. ***Large Container Ships***: Attraction of sharks, difficulties and dangers for small vessels , and oil transport issues

Contentious Areas[6]

The full operation of the port is not an immediate concern for the fishing industry because it is years away from reality. Port construction, on the other hand, has begun and the issues relating to it are relevant and need to be addressed now. The issue of port construction blocking current fishing areas was the second highest concern of surveyed fishermen and stakeholders. Over half of the respondents referenced blocking of current fish areas as an issue that needs to be addressed. The disruption of coral reefs and mangroves from dredging activities is another concern relating to the construction phase of the port. The Uwani Conservation Area is a coral reef area that was specifically mentioned as a concern by several respondents. The closing of the Mkanda Channel during port construction is the final issue considered in this section.

Potential Impacts of Contentious Areas

Construction of the first three berths is expected to start in the next few months and will take place along Manda Bay. When asked the question, *When port construction begins in Manda Bay, do you think construction will interrupt your fishing activities at all?* 86% of fishermen responded affirmatively. NEMA's project report affirms the fishermen's predictions. Even fishermen who don't currently work in Manda Bay are worried about the construction because it will lead to more competition in their areas of fishing. When port construction blocks current fishing grounds the fishermen will be forced to either relocate or stop working altogether. Relocation will lead to overuse and crowding in other fishing areas within the archipelago.

[6] Map of proposed port location can be found in Appendix 2

Another component of the construction of the first three berths is dredging activities. Dredging causes soil disposal issues that can negatively affect water quality and coastal ecosystems and resources. An estimated 11.8 million m3 will be dredged just for the construction of the first three berths (MOT 2011). Mangroves will be destroyed in the dredging process and the displaced sediment disrupts the coral reefs. Coral reefs and mangroves provide a habitat for fish and other marine organisms. Destroying the fish's habitat will deplete fishing stock and make these areas less productive fishing grounds.

Mkanda Channel flows between the mainland and the northwestern coast of Manda Island and lets out just north of Lamu Island. It is noted in the feasibility study that the Mkanda Channel is a key navigation route for the local fishermen because their small boats cannot navigate the outer sea. Their routes through the channel are necessary for movement between the small islands of the north and the southern Lamu Island (MOT 2010, 859). The port construction will cause restriction in the movement of small boats along this transportation route. This will also restrict access to fishing inputs and travel to other fishing areas. While it is acknowledged in the feasibility study that without access to the Mkanda Channel, there is no feasible route for fishermen between Lamu East and Lamu West, the construction is still set to take place.

Mitigation Strategies and Agents Responsible

Halting port construction is not a viable option but restricting access to key resource areas is possible and necessary. Designating specific areas as fishing zones for the local fisherman would help mitigate the loss of fishing grounds from port construction. Providing an alternative space for fishing activities is necessary if the local fishing industry is to be maintained. The creation of a fishing port near Mkowe is listed as a component of the short

term (2011-2016) plan in the feasibility study[7]. (MOT 2010, 877) This proposed mitigation measure would be extremely helpful if implemented but agents need to actively ensure the development of this action item. The Ministry of Fisheries is the key agency to follow through with this but the WWF could also put added pressure on the Government of Kenya to ensure this project is followed through. Despite all attempts to mitigate livelihood loss for the fishermen, some fishermen will be put out of work. In these cases, compensation for the fisherman for the financial losses that they will suffer is necessary. Finding alternative forms of livelihood for fishermen to pursue should be done in conjunction with the compensation packages.

The destruction of mangroves and coral reefs can be handled in a similar fashion. Restricting access to valuable ecosystems through the establishment and protection of conservation zones will help protect the marine life. The North Coast Conservation (NCC) project is currently working to create a sustainable ecosystem with protected no take zones that will help regenerate fish stock[8]. The structure of their program provides ownership to the community to protect their own ecosystem while preemptively protecting these areas so LAPSSET will not be able to destroy them. Developing plans for restoration, reconstruction and reforestation of the mangrove and coral reef ecosystems that will still be destroyed is another important component. In addition to the work NCC is doing, the Ministry of Forestry and Wildlife, WWF, NEMA, KWS, KFS need to get involved as well.

If the Mkanda Channel is closed or temporary unavailable, the only viable solution would be another travel route. The feasibility study alludes to the possibility that this will occur but

[7] Map of proposed fishing port can be found in Appendix 3

[8] " Scientific evidence is clear on the need for Marine Protected Areas (MPAs) that contain no-take zones, or fishery reserves where no fishing is allowed, as one of the primary management tools for fisheries in coral reef ecosystems, as found on Kenya's coast. o No take zones maintain healthy breeding populations which then seed surrounding fishing grounds. o No take zones export fish biomass into surrounding fisheries by adults moving out of the closed zone. o No take zones protect habitat and biodiversity and hence are an ecosystem based approach to maintaining fisheries productivity. (Samoilys., Maina, and Osuka. 2011a, 3)

pushes the planning process and promises off to a later date. “As the compensation to the fishery communities along the coast for environmental impacts, the possibility of dredging shallow sections in the Siyu channel for local boats might be studied to enable boat to transport through the whole seasons in a separate study” (MOT 2010, 145). The National Government of Kenya and the LAPSSET Corridor Management Board need to pursue this possibility. If an alternative route cannot be found for the fishermen then a search for an alternative route for the port activities should be completed.

Lack of Preparation for LAPSSET

The fishermen’s lack of preparation for LAPPSET is highly connected to some of the structural issues that were discussed in the risk assessment. The risk of isolated geographic location has contributed to the current issue of Lack of Communication with the Community. This issue is now the most highly reported concern coming from both artisan fishermen and key stakeholders in the industry. The risk of poor industry infrastructure has paved the way for a fishing industry that is lacking the necessary equipment as well as the necessary training to respond to the shock of the port project[9].

Potential Impacts of Lack of Preparation

The communities that are going to be most impacted by the port are being left out of the conversation. Most of the fishermen surveyed were terrified of the port and this terror is tied to the lack of knowledge and understanding surrounding the port. Two separate fishermen referred to the LAPSSET project as “The Tsunami”, with one of them explaining the nickname, “Tsunami. Tsunami. It's very sad. It's coming to kill us. They (the people of Pate) will be suffering and it will kill them economically”. Fishermen can't make well

[9] Photographs of fishing vessels and gear seen during the data collection phase can be found in Appendix 5

informed opinions or decisions because there is an information gap between the LAPSSET stakeholders and the community members of Lamu. No one is transferring information concerning what actions can be taken so fishermen are not taking ownership of the port or the stability of their industry.

The majority of fishermen do not have the necessary equipment or training for deep sea fishing. None of the fishermen surveyed had a vessel and equipment that they believed could be used for deep sea fishing and only one fisherman believed he had the skills and experience to sustain deep sea fishing activities. The small dhows, canoes, and sailboats limit fishermen's activities to the inner reef. Without the necessary training, it is also difficult and dangerous for fishermen to leave the inner reef. Port construction and operation are going to render inner reef fishing nearly impossible so the fishermen will be pushed unprepared into the deep sea if they want to sustain their livelihood.

Mitigation Strategies and Agents Responsible

The lack of communication with the community has been a problem since the planning process for LAPSSET began. However, it's not too late to start incorporating community members into the process and providing consistent updates on port progress. Monthly community meetings should be organized in each of the villages so community members can hear updates and give feedback on the port. These meetings could be organized by the LAPSSET steering committee. A few stakeholders mentioned that the steering committee has been struggling to disseminate information from their own meetings to the rest of the community. The Ministry of Fisheries in collaboration with the BMUs could work on organizing industry meetings for key stakeholders to discuss the port and keep the fishermen informed.

The obvious solution to the lack of equipment is to provide fisherman with the capacity for deep sea fishing through the provision of deep sea vessels, technology (gps and fish finders), and fishing gear. Finding financial allocations for these purposes is difficult. The WWF organized a project to help with the establishment of fishers' savings and cooperative societies in Faza, Kiunga and Kizingitini. The cooperative societies were able to help fishermen to start saving and access credit for improved fishing gear and crafts (WWF Norway 2011). During an interview with the Secretary of the Kizingitini Cooperative it was established that the Cooperative was not very active anymore because the initial set of loans provided to fishermen were never paid off. A majority of the Kizingitini fishermen are still relying on dhows and traditional fishing gears. The cooperatives need to have continual support, both financial and organizational assistance, from the government and organizations like the WWF if real progress is to be seen.

Government sponsored training sessions to prepare fishermen for deep sea fishing is a necessary component of assisting the artisan fishermen to move outside of the inner reef. Even if the necessary equipment and vessels are provided, safe movement into deep sea fishing requires technological training. Considering the recently reported statistic that Kenya is losing an estimated 10 billion shillings to Distant Water Fishing Nations who are capitalizing on Kenya's unused marine resource, investing in the local fishermen would be economically sensible (Kabubu and Mwakio 2014).

Large Container Ships

Once all 32 berths have been built there will be a bulk berth for 100,000 DWT bulk ships, a container berth for 100,000 DWT container ships and a general cargo berth for 30,000 DWT general cargo ships (MOT 2010, 2). The traffic of these large vessels will make it dangerous and difficult for the smaller vessels of the artisan fishermen to operate. The

waste emitted from these ships will attract sharks into the harbor. An increased number of sharks was a concern of many types of fishermen, but the lobster fishermen were especially concerned with the possibility of an increased number of sharks. Oil transport issues are the third impact concerning large container ships that was raised by the fishermen. As a representative from North Coast Conservation put it, "What port that is transporting oil hasn't had an oil spill?" Many other fishermen and stakeholders expressed similar concerns.

Potential Impacts of Large Container Ships

The Environmental Assessment Report identifies the effects of the project on maritime, boating and road traffic as one of seven potential impacts of the proposed project (MOT 2011, 16). Most fishermen are using canoes, dhows, and small motor boats. They risk being sunk and destroyed by larger ships if they continue operating alongside the massive container ships. If winds are stronger than 10m/s then the two way traffic design of the port is no longer safely feasible (MOT 2010, 870).

Sharks are known to follow the flow of ship traffic. They are attracted to the constant supply of waste being discharged from the ship. The port will quickly turn into a shark breeding environment which is not ideal for unprotected lobster divers. There will be an increased chance of injury and death for lobster divers who currently operate with flippers, goggles and occasionally a spear. One of the surveyed lobster fishermen calmly explained that his cousin, a fellow lobster diver, was killed by a shark just a few days beforehand. They are already working in a dangerous environment and the port activities could make it too dangerous for them to continue their activities.

An oil refinery located on the Lamu archipelago is one of the components of the LAPPSET project. While the oil refinery poses a series of risks on its own, the fishermen

surveyed were mostly concerned with the high risk of oil spills that could destroy the local marine ecosystem and deplete fishing stock (MOT 2010, 1582). There are also plans to build pipelines and product oil dolphin berths on the coastal area of Pate Island. The Feasibility Study follows up this specific project proposal with, "The preference of the people living in the Pate Island is rather development and employment for the young who have to leave Lamu due to lack of employment opportunity than stringent protection of the environment" (MOT 2010, 860). While this statement is valid, the impact of pipelines and oil transport is more than environmental. The livelihood of Pate fishermen is placed into jeopardy, making the "employment opportunity" of the oil project more of an employment exchange.

Mitigation Strategies and Agents Responsible

Special shore based radar and radar reflectors should be installed for safe navigation and collision avoidance. The Environmental Assessment Report mentions this as mitigation for the increased vessel traffic and the Feasibility study mentions a Vessel Traffic Control System (VTS) as a useful system for monitoring and controlling ship movement (MOT 2010, 866). The Port Management Board (PMB) will be assigned with monitoring and regulating the boat traffic (MOT 2010, 860). Mitigating the influx of sharks could be complicated and expensive but investing in the technologies necessary for diver safety is a worthwhile use of resources. The provision of safety equipment and more appropriate gear for diving in shark infested waters will help mitigate shark attacks and injury. Setting up satellite and acoustic tagging programs to monitor general shark activities and whereabouts is another option. These programs can be put in place by agents like CSIRO, a real tag developer (CSIRO 2014).

Prevention of oil spills is of utmost importance for mitigation of the oil transport issues. Experience has shown that oil spill cleanups are costly and prevention techniques are

much preferred. However, development of emergency contingency plans is also important. Establishing a reporting and alerting mechanism to ensure prompt reporting of spillage and investing in specialized oil spill response equipment are all necessary measures. It is the responsibility of the Oil Spill Mutual Aid Group (OSMAG) to ensure port compliance with internationally accepted standards of oil transport safety (MOT 2011, 189). It is also the responsibility of the PMB to monitor environmental discharge from ships (MOT 2010, 860). The PMB and OSMAG are going to need appropriate financial and capacity allocations from the Government of Kenya.

Implications and Projections

Considering the structural issues of the vulnerable fishing industry in conjunction with the negative impacts of the port's activities, leads to the conclusion that LAPSSET could bring an end to the artisan fishing industry in Lamu. The risk analysis assessment portrays the extreme vulnerability of the artisan fishing industry. Many of the negative impacts of port construction are related to the underlying risks of the industry. The port's activities will expedite and increase the magnitude of the risks and negative impacts compounded on the fishing industry. Addressing the factors that lead the fishing industry to be a vulnerable industry is a necessary step for mitigation efforts of the impacts of port construction. Holistic mitigation efforts need to begin immediately and continue throughout port construction and operation if the artisan fishing industry in Lamu is to continue operating.

Other Interpretations

Positive Transformation of Fishing Industry

The LAPSSET project will completely transform the Lamu archipelago, but this transformation does not have to be looked at as negative. The Port is a possible solution to the

structural issues and risks that the industry is currently suffering from. There are plans to build a fishing port and provide new technologies and vessels to the fishermen. The LAPSSET project could also increase market demand as population levels increase which could lead to higher profits for the artisan fishermen. Infrastructure in the form of roads and electricity will be installed so fishing inputs will be less expensive. While the potential negative impacts still need to be considered, the potential positive impacts may outweigh the negatives.

Self Destruction of Artisan Fishing Industry

The risk assessment portrays the vulnerability of the fishing industry and it's feasible to believe that regardless of port construction, the industry was headed for trouble. While the LAPPSET project will expedite the destruction of the industry, it also has potential for job creation in other industries and sectors. Job opportunities related to the port construction and operation will be available. While the older population of artisan fishermen may struggle to find jobs that they are qualified for, their children and the youth of Lamu will have a better chance for financial stability than their elders.

Recommendation for Future Work

A more technical study that could lay out specifics concerning the current potential of the fishing industry would be extremely beneficial for accurate evaluations of the economic implications of the LAPSSET project. In 2004 KMFRI and the United Nations University Fisheries Training Programme published an assessment of the Kenyan Marine Fisheries. In this study they mapped out current fishing grounds and evaluated the potential of different fishing areas. In this study it was admitted that data collected on the Lamu archipelago was not complete or extensive (Fondo, 2004). Conducting a similar, but more extensive, study

before port construction interferes with the industry would be extremely useful in evaluating the actual potential of the fisheries. Identifying the hot spots for fishing activities and the potential of these areas will allow for more educated analysis of the potential effects LAPSSET could have on the fishing industry.

The Kenya Coastal Development Project is working on Sustainable Management of Fisheries Resources. Governance and management of offshore and coastal fisheries resources, research on fish stocks, fish value addition and market chain enhancement, and fish production through sustainable aquaculture development are the project's main activities. These would all be useful mitigation actions for the port's impact on the fishermen, but quicker actions need to be taken. This collaborative project between Government of Kenya, Ministry of Fisheries, Kenya Wildlife Service, WWF, NEMA, and KMFRI is a great opportunity but if actions aren't taken before port construction then they won't be much use to the people of Lamu (KCDP 2014).

A more technical economic risk assessment would also be beneficial for this area of study. A useful framework based on settings, assets, and activities can be found in John Hoddinott and Agnes Quisumbing's report, Methods for Microeconomic Risk and Vulnerability Assessments (2003).

Conclusions

The LAPSSET project has the potential to severely impact the artisan fishing industry in Lamu. The artisan fishing industry suffers from a combination of structural complications that compound to create a multitude of risks for the fishing industry. An analysis of these risks depicts the vulnerability of the fishing industry and its inability to handle shocks. The LAPSSET port presents a likely shock to the fishing industry and the impacts of this shock

could be detrimental. The fishermen of Lamu are most concerned about the lack of communication concerning the port's activities and the blocking of fishing areas during port construction and operation. In general, there is a great sense of fear surrounding the port and the future of the artisan fishing industry.

Acknowledging the structural issues of the fishing industry and understanding the risks and vulnerability surrounding it is important in addressing potential impacts from LAPSSET. Many of the concerns around LAPSSET are related to the natural, social, and economic factors that have been plaguing the industry for years. Also necessary is the incorporation of the sentiments and thoughts of the artisan fishermen into the dialogue. They will be the ones most heavily impacted by the port so understanding their concerns is of utmost importance.

Moving forward, a continuous dialogue including artisan fishermen, key stakeholders in the industry, government officials, and LAPSSET representatives needs to be maintained. Preventative measures need to be taken immediately to address the needs of the artisan fishing industry before the LAPSSET port overwhelms them.

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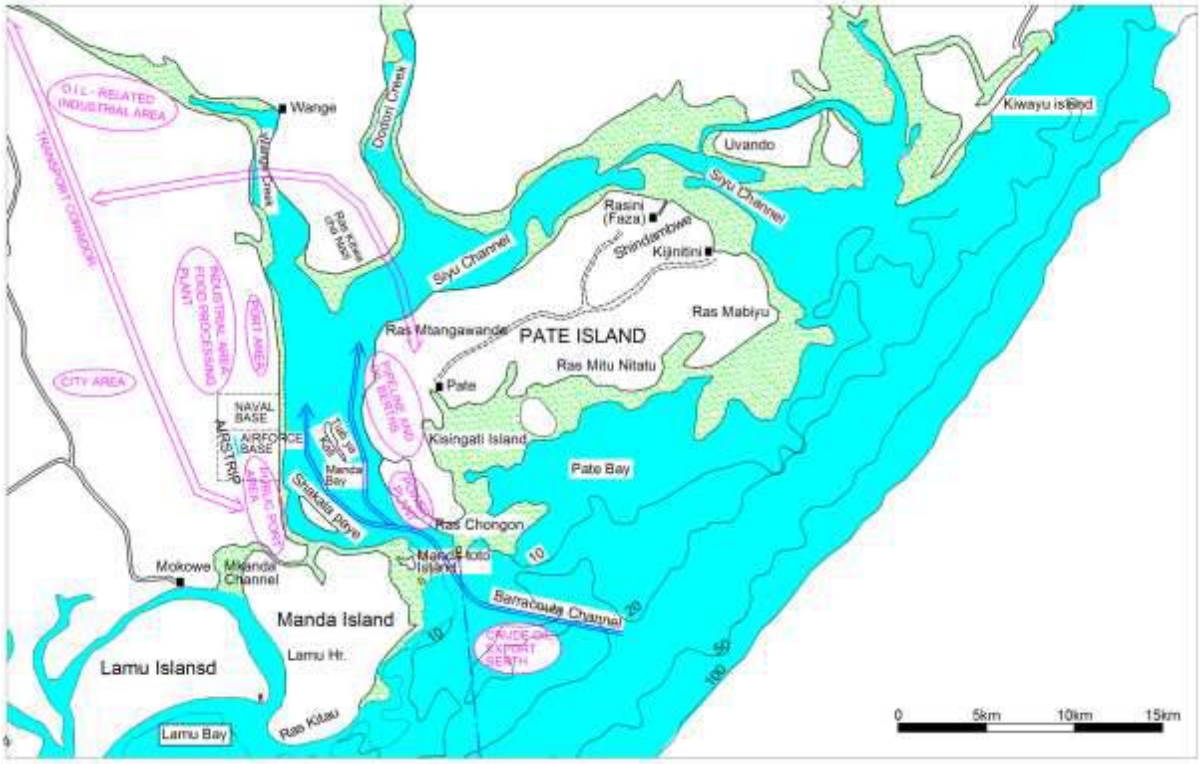
Appendix

Appendix 1: The 39 BMU Units in the Lamu Archipelago

Beach Management Units (BMU)			
Amu Zone	**Pate Zone**	**Kiunga Zone**	**Mainland Zone**
Amu	Faza	Ishakani	Lake Moa
Shela	Kizingitini	Kiunga	Lake Bulto/Didewaride
Kipungani	Mbwajumwali	Rubu	Lake Chalaluma
Matondoni	Tchundwa	Mvundeni	Lake Witu
Mokowe	Pate	Mwambore	Lake Kenyatta
Funga Mbuzi	Mtangawanda	Mkokoni	Ndambwe
Kiongwe	Shanga Rubu	Chandani	Mkunumbi
Ziwayuu	Shanga Ishakani	Kiwaiyu	Mangai
Tenewi	Magilini	Ndau	
	Nduweni		
	Kibaoni		
	Kiangwe		
	Siu		

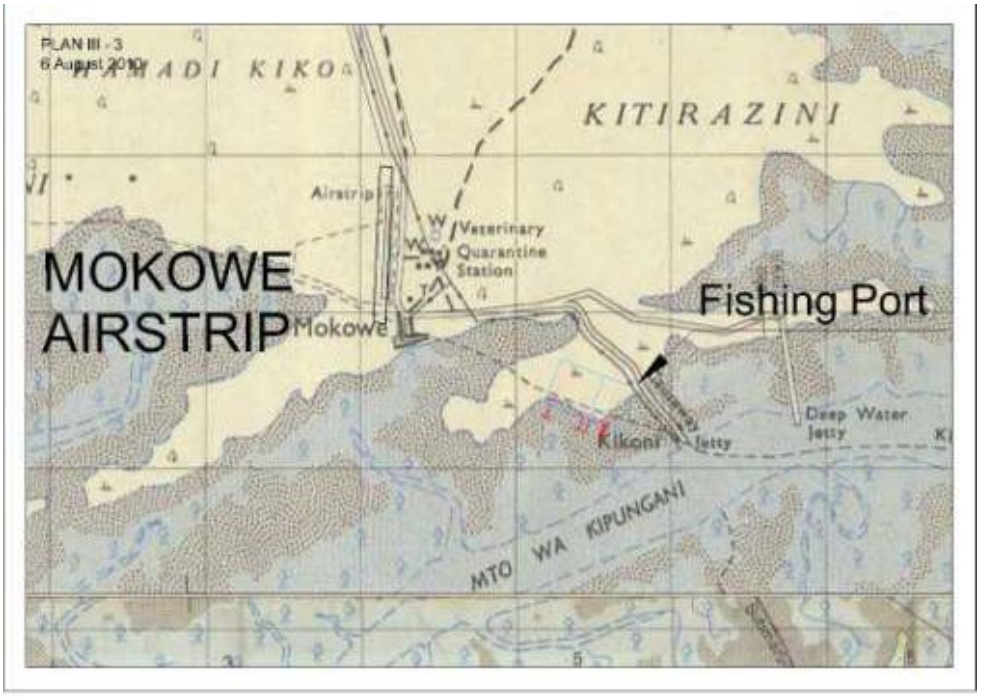
Names of BMU units were provided by Simon Komu, the County Director of the Ministry of Fisheries

Appendix 2: Port Zoning Map



Source: MOT Feasibility Study 2010

Appendix 3: Proposed Location of Fishing Port



Source: MOT Feasibility Study 2010

Appendix 4: Artisan Fishermen Survey

Interviewer Name:
Translator Name:
Date:
Location:

1. What is your name?
2. What is your date of birth?
3. What is the name of your residential village?
4. What is your marriage status?
    - Married
    - Single
    - Divorced
5. How many wives do you have?
6. How many children do you have?
7. If you have any other dependents, how many?
8. What is your average income per month?
9. How long have you been in the fishing industry? (How many years)
10. Are you the owner of a boat?
11. What type of fishing vessel do you use?
    - Sailboat
    - Motor Boat
    - Outrigger Boat
    - Canoe
    - Other:

      .
12. What type of fishing gear do you use?
    - Ring net
    - Gill net (girifa)
    - Trap (maema)
    - Hooks and lines
    - Beach seines
    - Diving
    - Spearguns
    - Other
13. What is the name of your BMU landing site, or your port of operation?
14. What is your usual area/region of operation?
    - beyond the reef
    - Dodori
    - Faza
    - Lagoon
    - Manda
    - Matondoni
    - the outer reef
    - Pate
    - Shela
    - the channel
    - the coastal lagoon
    - in the reef
    - in the reef lagoon
    - Other:

      .
15. How many crew members work on your boat?
16. Which of the following fish traders and input suppliers do you work with on a daily basis
    - Local fish dealers
    - Fisher dealers outside of the district
    - Supplier of fish gear or bait
    - Supplier of ice
    - Supplier of other inputs
    - Large scale fish processing agents
    - People doing grading, sorting, valuing, packing, and transporting of fish
    - Other:

      .
17. When port construction begins in Manda Bay, do you think construction will interrupt your fishing activities at all?
    - Yes
    - No
    - Unsure

      Explain Why:
18. Using your knowledge of the area, how many fishing boats do you think use Manda Bay for their daily activities?
19. There are three locations being proposed as possible new locations for the Navy Base Site, all of

which could have impacts on the fishing industry. Choose the site you think would be the best location and the worst location.

A-At Ras Kitwacha Nazi (Between Wange and Dodori Creeks)

B-Along Siyu Channel (further inwards from Manda Bay)

C- North of Kiwayu (facing Indian Ocean)

20. Do you think any of the three proposed sites are suitable locations for a Navy Base Site?
    - Yes
    - No
    - Unsure

    Explain Why:
21. If you were forced to relocate to deeper waters would your current boat and equipment be sufficient to continue fishing?
    - Yes
    - No
    - Unsure
22. Do you have the training and skills to be able to operate a deep sea vessel and the necessary equipment?
    - Yes
    - No
    - Unsure
23. If you were no longer able to operate your fishing vessel, do you have an alternative form of work to pursue?
    - Yes
    - No
    - Unsure
24. Of the following lines of work please choose any that you have experience or skills in
    - Artisan
    - Craftsman
    - Mason
    - Cook
    - Business
    - Other:
25. Do you think the fishing industry needs to take action to address current and future port activities?
    - Yes
    - No
    - Unsure
26. Concerning the new port, which of the following actions do you think would be helpful to you?
    - A petition (directed at the national government and addressing the concerns of fisherman)
    - Community Meetings (providing updates about the port and brainstorming solutions)
    - Newsletter (Focused on port activities and available at BMU offices/port landing sites)
    - Training sessions and skill building (in preparation for job openings at the port or deep sea fishing)
    - Other:

    .
27. Do you have any other thoughts or feelings concerning the new port?

Appendix 5: Images from Data Collection Period in April 2014

Medium sized dhow and ring nets in Kiwaiyu

Pile of ring nets by Faza waterfront

Young fishermen and their handcrafted vessel known as a “pafu” in Manda Bay

Dhows congregate as fishermen sell off their catch to a fish dealer near Faza

Appendix 6: Images from visit to Faza Ice Factory 29 April 2014

Empty ice box due to inactivity of the plant

Machinery used to power the ice maker

Machine was turned on for short demonstration