A COST-BENEFIT ANALYSIS OF MELFORD INTERNATIONAL TERMINAL

by

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Submitted in partial fulfilment of the requirements
for the degree of Master of Development Economics

at

Dalhousie University
Halifax, Nova Scotia
April 2017

DEDICATION PAGE

This paper is dedicated to my family. Those who were an inspiration to me in my youth and continue to support me, my parents Al and Lynn and my little sister Christine. As well as those who keep me going now. I would like to dedicate this to my loving wife, Haley, and my two young sons, Alain and Alex. Though my boys are too young to appreciate the challenge of balancing all the things that life throws at you, it is possible with support of friends and family to accomplish anything you set your mind to.

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ABSTRACT

A proposal to build a state-of-the-art container terminal in Guysborough County Nova Scotia has been announced by a private firm. This paper uses a cost-benefit analysis to evaluate the profitability of the firm but also seeks to go beyond the commercial benefits and asses the scenario from a regional development perspective, answering the question of whether or not Guysborough County, Nova Scotia will be better off should the *Melford Atlantic Gateway* be built and bring millions of containers from around the globe into this small relatively rural community.

LIST OF ABBREVIATIONS USED

AGV	Automated Guided Vehicle
CBA	Cost Benefit Analysis
CBSA	Canada Border Services Agency
FTax	Federal Effective Corporate Tax Rate
MITI	Melford International Terminal
MTax	Municipal Property Tax
PTax	Provincial Effective Corporate Tax Rate
STS	Ship-to-Shore
TEU	Twenty-Foot Equivalent Unit (measurement of shipping containers)

ACKNOWLEDGEMENTS

It would not have been possible to complete this work without the support of my supervisor Mathieu Dufour. We've had some life changes, but whenever you received a panicked message, you were there to guide me through it and show me that the problem was not that big. To my committee members, Patrick DeLamirande and Peter Burton for taking the time to review at the final hours and to Monique Comeau for always having the answers.

I would also like to say a special thanks to my family, my wife to give me the ability to work on the thesis, and take on the load of looking after the household for this time. I also want to make a special note to my oldest son Alain, I can't tell you how much it pained me to tell you that. "I can't play with you now, Daddy has to work on his thesis." With this paper completed we can play all you want, that goes for Alex too.

CHAPTER 1 INTRODUCTION

Trade today is truly global, reaching nearly every corner of the globe. Canada is the nation with the largest coastline in the world; it is neighbored to the largest economies: the US by land, China and Japan by the Pacific, and the European Union by the Atlantic. These factors contribute to its natural place as a world trader. International trade represents roughly 53.1 percent of Canada's 1.787 Trillion US$ GDP.

The majority of the world's cargo is shipped by sea. It is the cheapest method of moving cargo, so much so that, "it makes more financial sense for Scottish cod to be sent 10,000 miles to China to be filleted, then sent back to Scottish shops and restaurants, than to pay Scottish filleters." (George, 2013, p. 34) It is not only in modern times that moving goods by sea has been important to the world's economy. In fact, trade by sea has been preferred for as long as history can record, "Ships have always been, and for the foreseeable future will be, the most efficient method of long-distance transport." (Bernstein, 2008) Canada is no different in its reliance on the sea, having experienced an average 14.4% per year increase in container traffic between 1986 and 2008, from 1.13 million Twenty Foot Equivalent Units (TEUs) in 1986 to 4.72 million TEUS by 2008 (Figures 1 and 2). (Anderson & Monteiro, 2010)

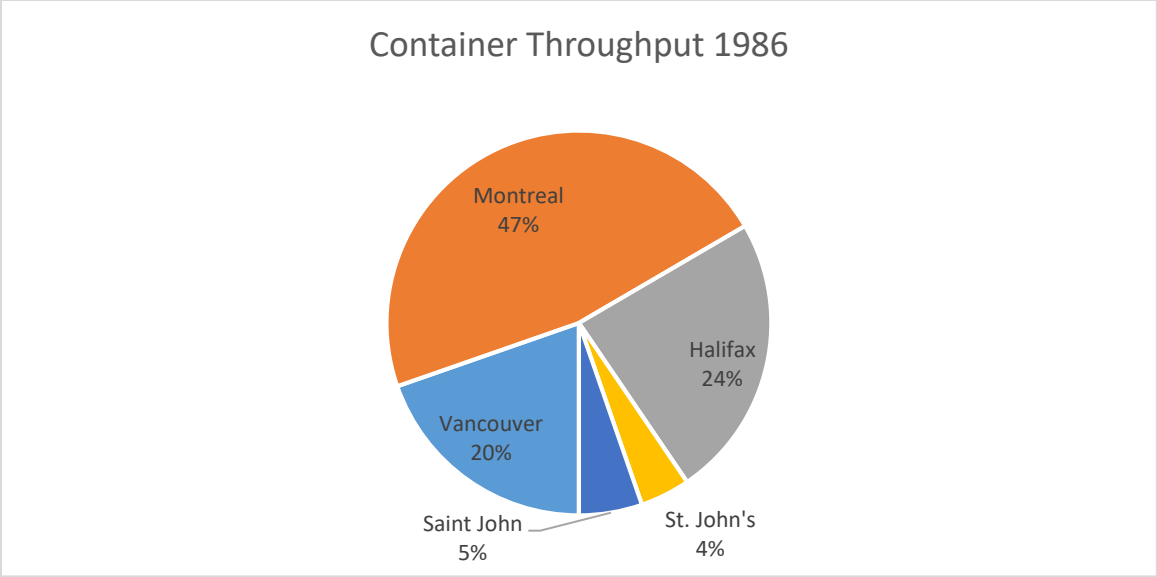


Figure 1: Source: (Anderson & Monteiro, 2010)

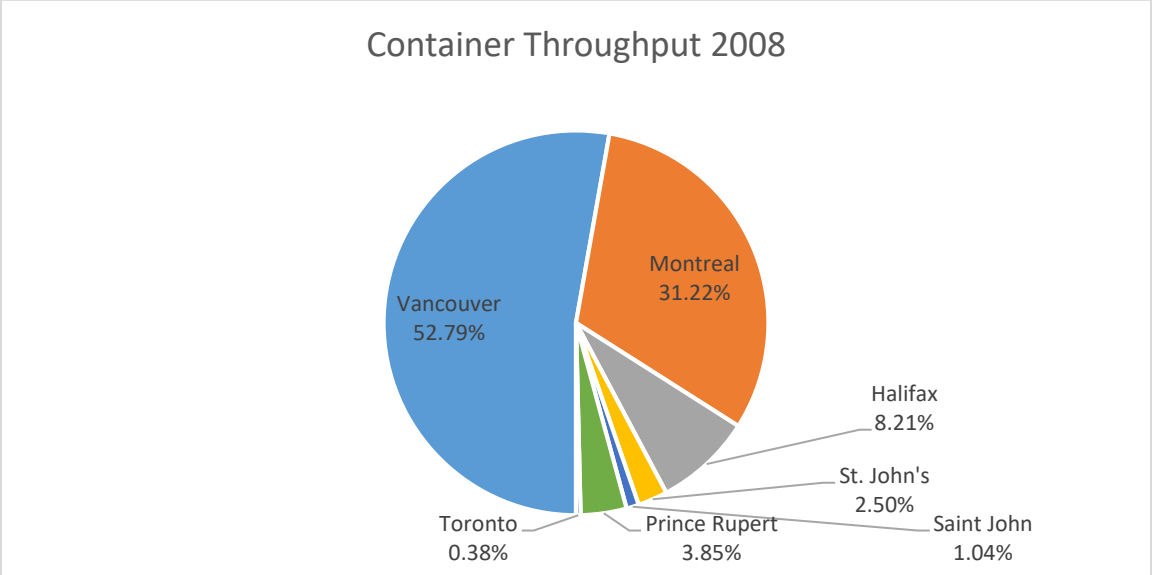


Figure 2: Source: (Anderson & Monteiro, 2010)

Nova Scotia

Because of its relative proximity to Europe across the North Atlantic, Nova Scotia's location at the north east point in North America has been of interest to European explorers and sovereigns since its earliest discovery by John Cabot in 1497. However, settlement would not occur until the French colony of Port Royal in 1605 and it was not

until the 18th century that Nova Scotia would rise in importance in world trade networks. Its growth occurred as part of the larger world-wide conflict between the British and French, with the ports of Halifax and Louisbourg representing the respective power holds in the region (Figure 3).

The French were first to establish large operations by building the Fortress of Louisbourg. The strategic location, found due north of Barbados, which was supplying rum, and its close proximity to some of the richest fishing grounds in the world with the ability to export dried cod in return and to send it east to France, helped Louisbourg in Cape Breton become the third busiest port on the continent throughout the 18th century. (Corbin, 1996) Louisbourg was an important trading post; however, it played a larger role as a military outpost protecting the mouth of the Saint Lawrence River the gateway to New France. The location of the Louisbourg fortress in North America gave control over the North Atlantic fisheries and trade routes; after several changes in ownership between France and Britain, the British destroyed the walls of the fortress in 1760. (Corbin, 1996)

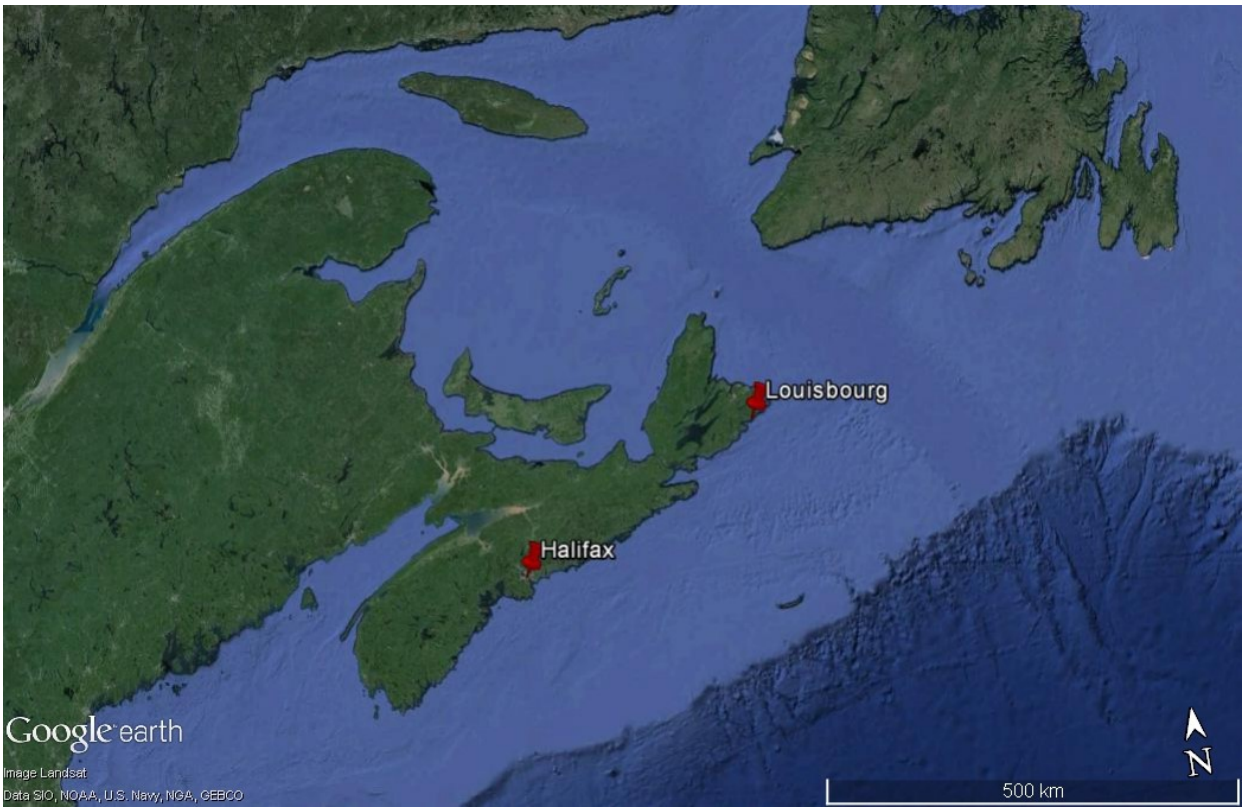


Figure 3: Source Google Earth

In figure 3, note the strategic placement of Louisbourg, protecting the entryway between the St. Lawrence River and the Atlantic Ocean. The British founded Halifax, further south in Nova Scotia as a counter measure to French Louisbourg, "the founding of Halifax in 1749 was a watershed in British imperial policy. The settlement was state-funded and served political not commercial aims." (Lennox, 2007, p. 373) The city was sustained by many wars throughout the 18th, 19th, and well into the 20th century, "[h]aving begun as a military enterprise it evolved, according to Raddall, 'into a community with a garrison identity, a place where soldiers and sailors, rather than civilians, set the pace of life and defined urban values.'" (Fingard, Guilford, & Sutherland, 1999, p. 5)

Owing to Nova Scotia's strategic importance, the actual shape that its economy acquired from the founding of Halifax was significantly influenced by public spending, especially on the part of the British government. Halifax was by no means a trading town, two thirds of the merchant vessels that used Halifax as a port of call between 1749 and could not find a return cargo and sailed in ballast. (Gwyn, 1998) This is not to say that trade would never become an integral part of the Halifax economy, but even today, the Canadian Armed Forces holds a significant portion of waterfront property.

In the late 18th century, trade was beginning to establish itself. "By 1780, two large vessels, *Adamant* and *St. Lawrence*, provided regular service between Halifax and Great Britain. Likewise, Halifax developed trade linkages with the West Indies, especially in the wake of the American Revolution, which ended in 1783. With American ports, no longer part of the British Empire, Halifax's trade with the Caribbean colonies soared." (Frost, 2008, p. 11) In 1785, the British Government forbade all trade by sea between Canada and the United States. This perhaps strengthened the inland trading route shared between Lower and Upper Canada with America. In response to this, the British Government issued another imperial order in council to prohibit, "the importation of all goods and commodities of the growth and manufacture of the United States into any of the ports of the Province of Quebec." While there was supposed to be no trade with the Americans, Quebec politicians and merchants interpreted the law to ban trade in seaports, allowing for continued trade by sea with Europe and by land with the United States. The primary trade at this time for Ontario and Quebec was the fur trade, but soon that trade

would evolve into agriculture. By 1802 Canada exported 28,200 barrels of flour and 1,010,033 bushels of wheat. (Creighton, 2002, p. 105)

The first decade of the 19th century saw the growth of an entirely new industry in Canada, the timber trade, from an infant industry to imperial importance. The Saint Lawrence River region proved to benefit immensely from its generous natural resources. During the same period, and notably during the war of 1812, Halifax still relied heavily on the military for economic stability; during post-war periods, times were hard. "The early 1820's were a time of profound readjustment for the city. The merchants of Halifax lobbied London for the type of protection that would recreate the boom-time conditions of the previous decade, but Halifax suffered from being outside the main commercial battleground between the U.S. and England as the two countries now struggled for trade supremacy in North America." (Frost, 2008, p. 17) Natural resources, such as fish and lumber, as well as American provisions made up Nova Scotia's export trade. Manufactured goods, produce, and other imports would primarily come from Britain. (Gwyn, 1998)

By the early 1850s, the average value of Nova Scotia's imports and exports to the United States had increased by 164 per cent, principally because of easing American tariffs. (Gwyn, 1998) In 1867 the provinces of Ontario, Quebec, New Brunswick, and Nova Scotia come together in a confederation, establishing the nation of Canada. While Ontario and Quebec carried the majority of the young nation's population, Nova Scotia still played a role as their major trading port by sea. Most of the emphasis on economic

development continued to stress Halifax's natural role as a port, particularly a winter port for Canada. In order to improve Halifax's ability to ship goods to and from central Canada, the Board of trade sought better terminal facilities for storage and rail transportation, an expanded rail network and faster ocean steamers, measures which, it was thought, would give Halifax the edge over its rival Saint John. The need to improve harbour facilities had long been recognized by the federal government and in 1912, a commitment to act was made by the new Conservative Government. Just prior to the outbreak of the First World War, Frederick Cowie, a Montreal based consulting engineer, reviewed government plans to increase cargo handling in Halifax. The Cowie Report, "was predicated on expanding markets and was not designed to take business away from other Canadian ports. This new business was to come from Central and Western Canada. From his perspective, it combined the best and most successful features of harbour design and the most up-to-date railway terminals." (Frost, 2008, p. 72) Although none of the components of the south-end Ocean Terminals was started before the war, the new railway track through the massive rocky terrain to the west and south was operational by 1917. (Fingard, Guilford, & Sutherland, 1999)

The late 1950's saw the construction of the St. Lawrence Seaway, which opened the interior of Canada to the ocean. By 1960, Montreal handled twice the tonnage of Halifax, and while Halifax had been the exclusive winter port for Eastern Canada, this was to change in 1962 when the Federal Government decided to commence ice breaking in the St. Lawrence River, opening up Montreal for year-round service. With these changes, shippers charging the same fee to ship to Halifax or Montreal, and the introduction of

Canada's first container terminal in 1968, the Port of Montreal saw a boom in business. Fortunately for Halifax, it was not at its expense. Trade increased around the globe in the 1960s and while Montreal was growing by leaps and bounds, tonnage remained constant in Halifax.

The new era of international trade was ushered in by the standardization of a large metal box, pushing forth a new definition to globalization. It is well noted that the adoption of the container was not the initial instigator of globalized trade; rather it enabled its rebirth. Sailing vessels covered the globe for many years, but in the 20th century, which included two world wars, as well as periods of trade protectionism and inward-looking development, this "progress" was stymied. (Levinson, 2006) Following the First World War, many of Keynes' predictions from the *Economic Consequences of the Peace* were realised. International borders had closed their gates, and trade was no longer moving as freely as it had, and would not for many years. The Second World War did see merchant convoys of goods crossing the North Atlantic, but it was a military objective to aide in the war effort, not an effort in trade. It was a costly proposition for these merchant vessels to make the crossing and many were sunk by German U-boats, which would prove to be very costly to the shipping industry after the war.

Various attempts were made with using standard containers to move goods. The US Army was one of the first to move the effects of soldiers and equipment overseas. It was not until April of 1956 that the first official container run took place, where the *Ideal-X* completed its run from Newark to Houston carrying 58 metal boxes, loaded onto waiting

trucks. Trying to find a more competitive method of transporting goods around the United States was the primary concern in the development of the sea container. (Levinson, 2006)

As the world moved through the 20th century, new technologies and more powerful engines were coming into light and the method by which goods moved from the manufacturer to the consumer was beginning to enter a battle of transportation modes. "Up through the end of World War II, trains had been the way that most companies moved their goods. Railway's freight revenues were nine times those of intercity truck lines in 1945, when more than 400, 000 carloads of manufactured goods as well as most of the nation's coal and grain were shipped by rail." (Levinson, 2006, p. 152) However this began to change once the war had ended. The 1950s was, "the decade of the truck. Better roads, including widespread construction of expressways, permitted larger trucks carrying heavier loads at higher speeds. The use of 40-foot trailers on superhighways instead of 28-foot trailers on congested two-lane roads led to large productivity gains that helped truckers take business form the railroads." (Levinson, 2006, p. 152) As the supply chains established themselves within the US and trucks started to fill the freeways of North America, thoughts began to move towards the idea of putting the boxes that were being towed onto ships. "The new, fully containerized vessels began to come on-line in 1968. Ten containerships per week sailed the North Atlantic that year, carrying a total of 200,000 20-foot containers holding 1.7 million tons of freight." (Levinson, 2006, p. 166) Very quickly fleets of container ships grew, Ocean carriers added 272 containerships to their fleets between 1976 and 1979. Four times during the 1970s, worldwide container

shipping capacity increased by more than 20 percent in a single year. Total cargo capacity aboard containerships, 1.9 million tons in 1970, reached 10 million in 1980, not counting the tonnage of vessels designed for a mix of containers and other freight." (Levinson, 2006, p. 233)

Halifax was visited by its first purpose-built container ship in 1969 and the trend grew quickly. The following year Halifax handled 20,800 TEU's and was one of the 90 ports worldwide with container facilities. Total tonnage increased by 10 percent over the previous year, setting a new record. By 1972 the port handled almost 86,000 TEUs and was ranked 32nd out of 105 container ports worldwide. The story of Halifax was one of growth, however within several years the port fell to 86th in world container port rankings. To compensate for this the port took on other cargo. In 1970 the Autoport opened to import European cars. In 1997 a new terminal opened dealing specifically in forestry products. The largest business that the port of Halifax is involved in besides containers is oil, the import of raw crude and the export of refined oil. (Frost, 2008)
The first voyages to the America's aided in speeding up the process of global integration. Today's massive container ships, jet planes, the Internet, and increasingly globalized supply and manufacturing network are just further evolutionary steps in a process that has been going on for the past five thousand years. There is plenty to be gained by being able to be a link in the supply chain and not simply a destination for goods, these benefits include jobs, access to more goods, in faster times. At the same time there are negative effects that follow the success of a port, such as congestion, pollution, as well as increased stresses on public services. The purpose of this paper will be explore both sides

of the issue based upon the proposal of a new site in rural Nova Scotia, which may introduce all of the above.

Melford International Terminal

In 2006, a group of private investors proposed to build another east coast container terminal in rural Nova Scotia, with the objective of bringing trade back to Nova Scotia, acting as the intermodal to the United States mid-west. The proposed location for this terminal is in Guysborough County, on the eastern mainland side of the Canso Strait. There are several potential advantages to this location and the investors of Melford International Terminal Inc. are looking to capitalize on the relatively cheap land as well as new technologies to maximize the benefits of capital over labour. The firm is, "proposing a state-of-the-art intermodal rail container logistics terminal on the Strait of Canso at Melford Point." (AMEC, 2008) The definition of state-of-the-art is subjective but it means reducing the need for human operators, instead relying on robots and computers to move containers off enormous seagoing vessels onto trucks and trains to send cargo inland. The purpose of this paper is to explore the costs and benefits of such a proposal, in an effort to determine if a privately-operated port is a viable and profitable venture, and if the community and region will be better or worse off as a result. Ideally the project would both be viable for the investors but also improve the situation for the residents of the community.

In October 2008, the Nova Scotia Minister of Environment, Mark Parent approved the environmental assessment for Melford, stating that "I am satisfied following a review of the information…that any adverse effects of significant environmental effects of the undertaking can be adequately mitigated…" (Department of Environment, 2008) An extension for the commencement of work on the project was granted in October 2012 for two years, followed by another 2 year extension in October 2014 and yet another 2 year extension for the commencement of work to be started October 23, 2016 and expiring October 23, 2018. (Department of Environment, 2016) The project has been delayed many times, and earlier this year, things looked dismal for the project with headlines such as "Melford Terminal still has no carrier, but proponent optimistic". Things appear to have turned around as of the summer of 2016, where Melford announced a partnership with SSA Marine, which has more than 250 container terminal and rail operations, with this it looks like Melford International Terminal has a chance to be built. SSA Marine brings its status as "the world's largest independent, privately held marine terminal operator" and it is hoped that its influence will be able to bring the traffic needed to push forward. (The Chronicle Herald, 2016)

CHAPTER TWO PRIVATE COST BENEFIT

Cost-benefit analysis is a methodology used for estimating the positives and negatives of a given project, policy, or decision, by using dollar values, to ultimately assess the desirability of the choice. Weighing both the costs and benefits of a given choice allows for a more informed decision on whether to act on the current project or policy, or to perhaps move in a different direction if it is found that the costs exceed the benefits. It is important to note that while the exercise uses dollar values to estimate the viability of a project, it does try to capture the wellness of the citizens. There are many aspects that influence a population beyond the construction of a project. One must consider the costs and benefits to society, including things such as the environment, traffic, jobs, taxes, and contrast this against alternatives if the project were not to move forward. Melford International Terminal is the focus of this study. Traditionally, cost-benefit analysis is used for public projects, to help determine if the project is economically viable and to assist in the comparison against other options for the same resources. In this case, the project is privately funded, and therefore there will be a double concern of private profitability and public benefits. As with most things, it is not a clear cut situation and there are some public costs that need to be accounted for in most private projects, whether it is tax breaks or discounts on land or resources. With this in mind, I plan to conduct a Cost-Benefit Analysis of the proposed Melford International Terminal, and produce an analysis based on its private viability but also the public implications to determine if society is better off or worse off with the completion of this project.

In the instance of Melford International Terminal Incorporated (MITI), there are two clear options: as the land is currently untouched, it would be possible to halt plans and leave everything the way it currently exists or to move forward with the development of the project. While the majority of this analysis will focus on the latter alternative, it is critical to establish a base case scenario against which the costs and benefits of the Terminal project can be measured, particularly in establishing the public benefit associated with developing the land. Not only should the benefits of the Terminal project outweigh the costs, but the net benefit should also be higher than what could be obtained by leaving things as they are.

2.1 Identify Base Case Option

The Greenfield site is a virtually untouched piece of land. Currently, Melford is an unblemished tree-lined coastline with a handful of residents. Should the project not go forward, the crown would retain the land and all that would be lost is the time and planning already invested. As these are sunk costs, they will not be taken into account going forward.

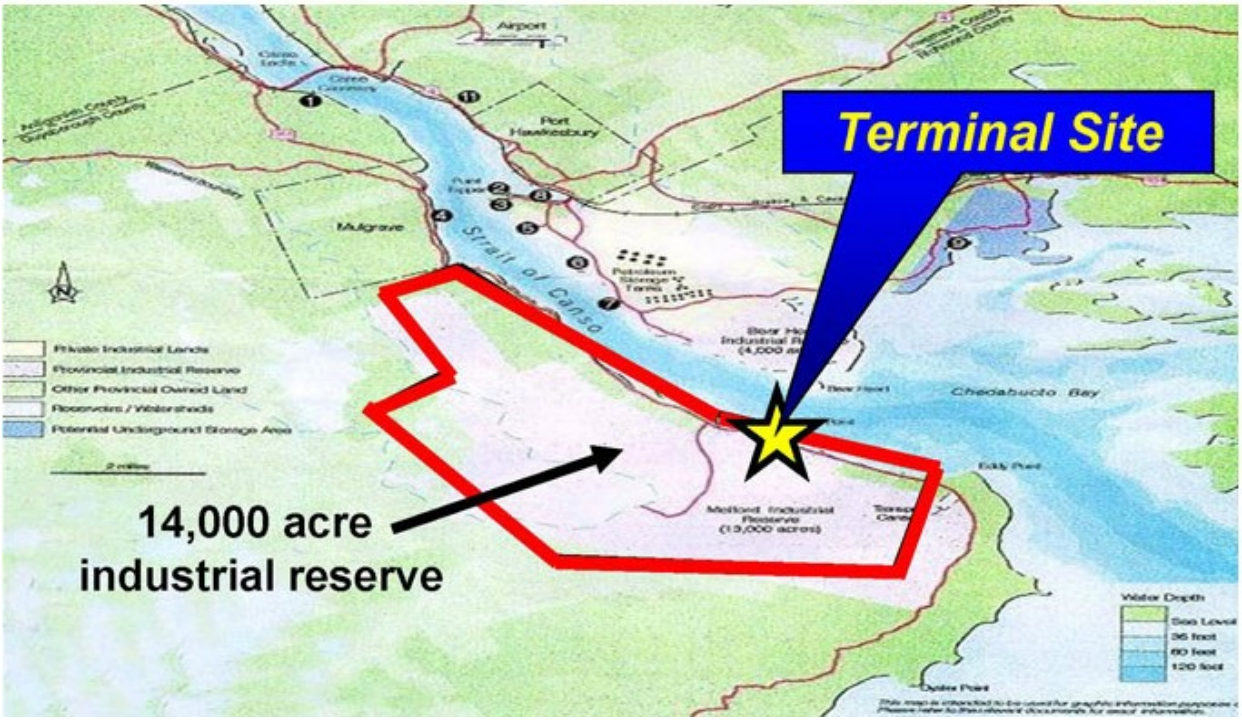


Figure 4: Location of Melford Atlantic Gateway on the main land coast on the Strait of Canso, within the Melford Industrial Reserve (Source: http://www.mahermelford.com/)

If the project was cancelled, Halifax would continue to operate as the leading port in Atlantic Canada for the foreseeable future. At present, it serves Atlantic Canada with a small share of Ontario, Quebec, and the US Midwest markets. (Frost, 2010) This would provide a blank slate for the government's Atlantic Gateway initiative. A memorandum of understanding was signed between the federal government and the four Atlantic Provinces to develop the Atlantic Gateway (Transport Canada, 2012). Melford is not a part of the Gateway plan, so abandoning the project would allow for the governments to function without any competition, beyond that which already exists in the Port of Montreal. In addition to Halifax the government has also been investing in Sydport in Sydney, Nova Scotia which is undergoing dredging, so that it will be deep enough to

handle larger vessles. The work in Sydport is backed by federal money and if Melford were not to go through, the government dollars would meet little resistance or competition.

2.2 The Melford Project

The proposed project is to be built in Guysborough County of Nova Scotia, Canada. Melford International Terminal Incorporated has made plans to build a new intermodal container facility on the Strait of Canso that hopes to be one of the superior facilities on the East Coast and to offer an alternative to the other cities along the eastern seaboard. Melford hopes to achieve this success by building a facility that uses the latest technology for handling and security, combined with an efficient port design and low land values in a rural region. The terminal aims to act as the sea based port for the US Midwest, and its primary goal is not to directly compete against Halifax. “Containerships from the Suez Canal would be transloaded at Melford to CN rail for delivery to Montreal, Toronto, Detroit and Chicago...Melford has a memorandum of understanding for deliveries to Toledo, OH” (Hull, 2012) As vessels continue to grow and push the limits of their existing berths, Melford aims to meet the demands of tomorrow by exceeding the requirements of today.

Melford International Terminal Inc. is a privately-owned company leading its own project. On July 6, 2016 SSA Marine, Melford International Terminal and Cyrus Capital Partners, L.P. announced their partnership in developing Melford Atlantic Gateway. The

roles of these partners appear to be straightforward: SSA Marine, an international port operator, will operate the terminal, Melford International Terminal will build the project, and Cyrus Capital Partners are the large financial backers. Consequently, the constraints under which the company operates are different than if it were a government project, most importantly are the costs in regulating a port authority. In this chapter I will conduct an analysis for the private sector, subsequently the Chapter 3 will focus how the terminal will affect public welfare. It is assumed that the project has undergone the due diligence of expected profitability and that in continuing construction, the firm is seeking profits. This project has the potential to change the way business is done in Nova Scotia and Atlantic Canada, and therefore it is necessary to venture beyond a calculation of private profits and see if society will benefit from the project, especially since the government has made some concessions to the company to allow the project to go forward.

The project costs that will be incurred by the firm will be outlined in the following broad categories; Land, Capital, and Labour. For the purposes of this paper all numbers are given in as 2016 real values, estimates are made to reflect the ultimate goal as stated by the firm. This assessment will look at a 9-year term, with the first phase to begin in 2016 and the second starting in 2019 and the final in 2022.

2.3 COSTS

This assessment will look at the three major factors of production: land, labour, and capital. In some instances, the data were readily available from public meetings, newspaper articles, and the Environmental Assessment, in other cases, getting the information was a bit more of a challenge, requiring contacting private firms, such as TBA Solutions, and in other cases developing models to estimate the costs. The following sections will address each factor individually, outlining the figures that have been proposed by the terminal, and verifying to the best of my ability that they do make sense and that the firm is not exploiting public benefits through questionable calculations.

The assessment period of this project is 2016 – 2024, a nine-year period that it broken into three phases 2016, 2019, and 2022. These phases are more related to large capital expenditure, increasing terminal capacity as well as the hiring of labour, and therefore a more detailed explanation will occur below.

2.3.1 Land

The importance of location is well known, and the location chosen to build the container terminal has several strategic benefits. The first being the distance to the Suez Canal, and its location on the great circle route, allowing for the "ability to reduce delivery times to US and Canadian markets by 2 to 6 days." (Melford Atlantic Gateway, 2016) Secondly, the location on the Straight has a 20-metre-deep water draft, allowing for even the largest ships in the world, Maersk Triple E Class with 14.5 metre draft, to come. (Ship-Technology.com, 2013) Finally, one of the other key components related to location is

the land that the terminal will occupy. As noted above, the plan is to build a 315-acre container facility with an adjacent 1500-acre logistic park. Given the location in rural Nova Scotia, it is expected that the total cost of the land would be far cheaper than purchasing that amount of land in an urban locale. In addition to this, the associated property taxes ($0.61 per $100 valuation) (Municipality of the District of Guysborough, 2016) are far less than the effective rate in the provincial capital of 2.721%. (Found & Tomlinson, 2016) The Municipality of the District of Guysborough advertises the land for potential investors with "low industrial land costs, low initial investment costs, low transportation for marine, rail, and highway [and] low construction costs." (Municipality of the District of Guysborough, 2016) There has been a drive upwards in the costs of land in the province, particularly water front properties. However, Guysborough County has continued to be a depressed region and it has not experienced the same increase in land prices, even after the Melford Terminal purchase. A recent listing for a waterfront property near the project site was $150,000 for 15 acres of land including buildings. (Realtor.ca, 2016)

There were three separate pieces of land that were required to purchase. Starting from the water, the Province owned the rights to the waterfront property. Next was the land adjacent to the water which was owned by local residents as well as the Municipality. Finally, the location where the logistics park will be built was designated Melford Industrial Reserve by the Nova Scotia Government in the early 1970s as part of a planned oil refinery that did not come to fruition. The reserve placed 14, 500 acres in the possession of the Provincial Department of National Resources, and currently promoted

by Nova Scotia Business Inc. There was one final piece of land that was included in the deal with the Municipality, it was a tract of 32km of land of a former rail bed, which connected Mulgrave to Cape Breton, prior to the Canso Causeway built in 1952, where a new rail line will be built to connect the terminal and logistics park to the current CN rail line.

There were early reports that Melford "is acquiring a large tract of Nova Scotia Crown land valued at more than $5 Million for its planned container terminal on the Strait of Canso." (Power, 2009) This land was purchased from the province, on the industrial reserve with an option to purchase up to a total 1,500 acres for the planned logistics park. It is also likely that some of this deal with the province included the water property. The article states that MITI was paying fair market value for 177 hectares, which is approcimately 437 acres, which makes up the initial phase of the logistics park and the rail corridor. At the price of $5 Million for 437 acres equals a per acre price of $11,441, which seems to be consistent with the market value of land in the region.

In September 2013 it was announced that MITI had taken possession of the lands of the Municipality of the District of Guysborough, the lands needed for the container terminal, which involved the purchase of 80 different parcels of land. (LeBlanc, 2013) Melford Terminal purchased this land directly from the municipality, however, the munipality had to assemble the pieces of land, some which had been owned by residents, to sell to the firm. There are no public data available and therefore it is not clear what the purchase

price is for these individual sales, however it is assumed that the average price per acre in the purchase of provincial lands will hold true for these sales. While Nova Scotia Business Inc would not disclose the value paid by this deal, they did confirm that I was in the right ballpark. Assuming that these properties will make up the total of the 315 acre, at a price of $11,441 per acre, the purchase price would be $3.6 Million.

The entire project consists of the 315 acre container terminal and the 1500 acre Logistics Park. Above I presented that just under half of the land has been acquired 752 acres of a total 1815. Given there has not be any significant growth in the land value the past few years, holding the price constant at $11,441 per acre would cost $12.1 Million for the remaining 1063 acres. This would mean the total cost spend on land throughout the entire project would be $20, 765, 415. At its current stage it is estimated that MITI owns 752 acres of land, using the same value, would mean the total spent is at $8.6 Million.

2.3.2 Capital

Operating a container terminal requires some very specific and expensive capital investments. Cyrus Capital Partners, which manages $4.5 billion of investments across the entire capital structure of companies, is the major financial backer of the project. (Cyrus Capital Partners, 2017) The desire of the Melford project to rely heavily on advanced technologies will increase the capital requirements above what a typical terminal would currently need. Terminal operations consist of equipment to take the containers off vessels, Ship-to-Shore (STS) cranes, and means to get the containers

around the port, traditionally trucks. In the case of MITI they are proposing the use of AGV's (automated guided vehicles). The containers then must be stacked while they await their next movement, for which rail mounted gantry cranes are necessary. Finally, the containers are moved once more from their location in the stacks to the flatbed or a truck, or as it is hoped for the majority of cargo onto a train, headed west.

The values in this section are based on 2016 prices when available. Throughout the research of this project, I have reached out to many companies to get a price on their equipment. TBA Solutions based out of the Netherlands did provide me with an estimate for the equipment in 2015 Euro's, which were exchanged to Canadian Dollars. The data that was provided by the firm were in 2011 dollars. To compensate for the lag in project start time I have brought these figures forward to 2015 using the implicit chain price index for machinery and equipment. The project has undergone a number of delays. For the purposes of my study, I am assuming that the construction period will be 2016-2024, broken into 3, 3-year phases: 2016, 2019, and 2022. The quantity of materials purchased will be outlined below, based on their costs and phases; these costs are going to be in present day dollars. For detailed tables outlining the costs and quantities discussed below, please see Tables A and B in Appendix A.

The STS Gantry cranes are likely the first thing you think of after the container ships in a terminal. They are the large cranes that reach out over the docks to the ship to load and offload the cargo as quickly as possible. The first phase of the project will require 3

cranes, with an additional 3 being purchased in 2019 and again in 2022, at a cost of $10.6M for each crane. This means the initial cost in phase 1 is $42.5M, and an additional $31.9M for phase 2 and 3, with the total cost for STS cranes being $106.4M. Working with the STS cranes is where MITI is looking to introduce some modern technology over the traditional port operations that would have trucks picking up the cargo; they are looking to use AGV's to perform this function. The advantage of AGV's for MITI is that people would not need to operate machines, although technicians would still be required for maintenance purposes. These AGV's will be the work horse of the terminal operations and come with a pricey sticker price of just over $709,000 a unit. Melford expects to purchase 25 on the initial order, eventually reaching 70 total by 2024, for a total cost of $48.2M. There will also be a few special lift AGV's, that are capable of lifting the cargo from a waiting area without needing the direct interaction with a crane. These units are costlier, at $780,000, and it is expected that the terminal will purchase 7 by 2024 at a cost of $5.46M. Another set of cranes sit further inside the terminal, the rail mounted gantry cranes are the ones that actually put the container in the stacks, pulling the box off the AGV. These cranes are approximately $2.8M per unit. The initial purchase would be 10 cranes, with 8 in 2019, and another 6 in 2022 with the total number reaching 24 by 2024, for a total cost of $68M. The final important capital cost will be the railway cranes and a truck crane, as MITI anticipates that the majority of containers will leave on a train, these are important as the final touchpoint of the terminal. The project will start with 3 railway cranes at a price of $5.7M and add 5 by project end for a total of $45.4M. There will only be 1 truck crane for $3.5M.

The initial purchase of capital in 2016 would be 10 rail mounted gantry cranes, the truck crane, 26 AGV's, 3 Lift AGV's, and 4 STS cranes, as well as 3 railway cranes, which would cost an estimated $114,498,500. Maintenance costs for the project will be estimated at 5% per year, $5.7M. Therefore, the total costs of the initial purchase order will be $120.2M in 2016 dollars.

2019 will be the first year of Phase 2 that will see large capital improvements as the port grows. An additional purchase in 2019 of 3 ship-to-shore cranes, 16 AGV, 1 Lift AGV, 5 rail mounted gantry cranes, and an additional railway crane will cost the project an additional $67.89M. Maintenance costs from 2016-2019 are estimated at $9.4M, giving a total cost for purchases made in the 2019 year at $215.6M.

Figure: 5: Melford International Terminal Fully Operational Source: Chronicle Herald

Phase 3 would include the final purchase years for the project, bringing the port to the level of the artist rendition in Figure 5 above. By 2024, it is expected that all of the equipment will have been purchased. That is: 10 STS cranes, 24 rail mounted gantry cranes, 8 railway cranes, 1 truck crane, 68 AGV, 7 Lift AGV. With all of these expenditures the total cost in current dollars are estimated to be $330.46M plus 5% maintenance fees. See figure 6 below for a year over year expenditure

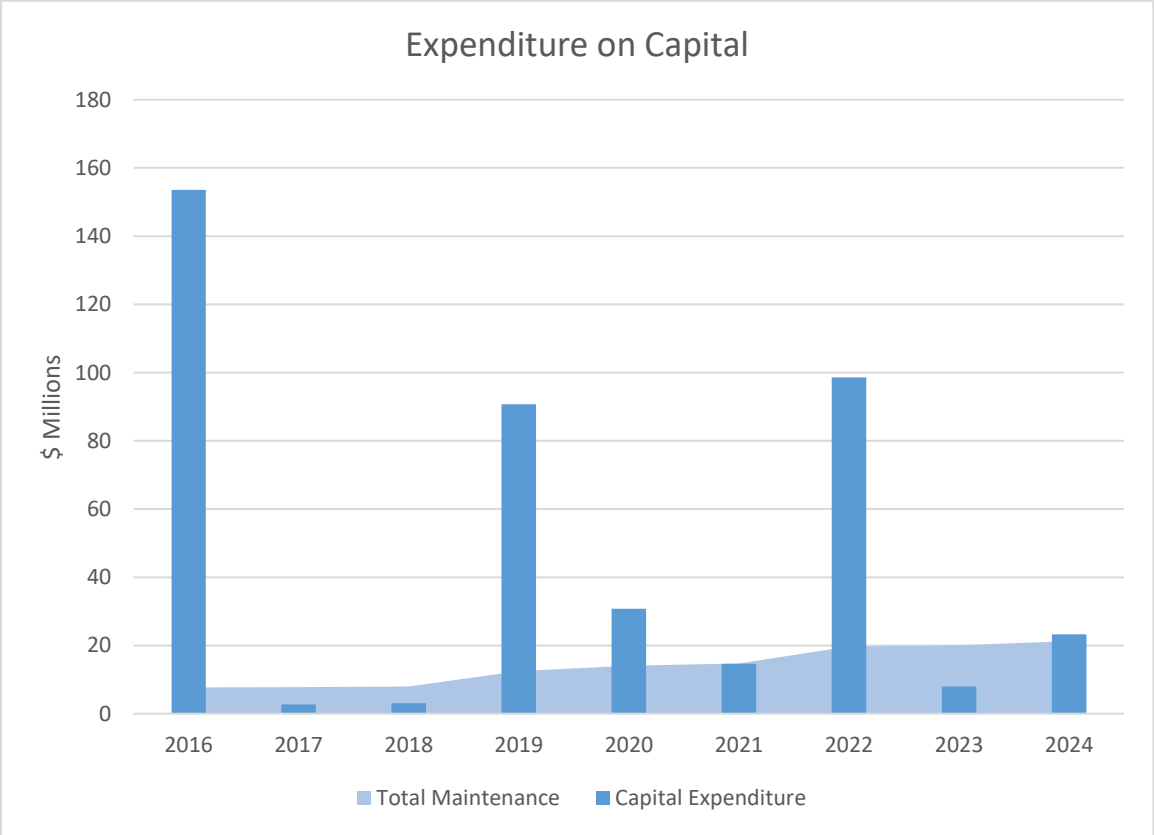


Figure 6: Total Capital Expenditure

2.3.3 Labour

Nova Scotia is a have not province, and as such has an unemployment rate above that of the national average at 6.8%. The Eastern Region of Nova Scotia, where Guysborough is located, had a rate of unemployment at a staggering 16.5% as of March of 2016. (Government of Canada, 2016). Any new jobs to this area would be welcome, and MITI is offering employment in the forms of construction (to a max of 10 years) and potentially more long-term positions working directly for the terminal. While the promises of jobs are not insignificant, it is important to remember that this is a private firm looking to reduce costs, and labour is one of those costs. Traditionally, ports and terminals have strong labour unions. As this is a new port no unions exist and in an effort to reduce costs, MITI is trying to limit the number of people who come in direct contact with the compound by using machines. While systems like the AGV's would be able to replace humans, there would still be a need for human labour. The largest labour requirement will be in construction, as well as administration and operations and technical staff.

There are two types of employment that will be looked at as part of this paper. The first being direct employment, which refers to those jobs that are created that are paid by and work for the terminal. The other employment is referred to as indirect, and while they may be directly linked to the port, by supporting terminal operations, they are not employees of terminal, but rather these jobs are created as a result of the terminal, which is why they are captured as part of the cost-benefit analysis.

The first jobs in the region will be those in construction; various trades will be required throughout the duration of the project. The Environmental Assessment of the Proposed Melford International Terminal indicates that around 3000 direct person-years and 2000 indirect person years will be needed throughout the construction of the terminal. This represents approximately 500 jobs, (Myrden, 2010) using this figure it would mean that each job would represent an average of 6 years to reach the 3000 direct person years. In a community of approximately 8,000 residents in 2011 (NHS Profile, 2016), 500 new jobs can have a dramatic impact. The Environmental Assessment reasons that there should not be an influx of families moving to the community given that a large portion of the employees will come from the area, and those who are coming from away will commute given historic trends of other large projects in the province. According to Cansim table 281-0003, the average weekly wages of a construction worker in Nova Scotia in 2015 is $952.20. With an average workweek of 40 hours, this would make the annual cost of one construction worker $49,514.40. It is estimated that there is an additional cost to employers above the salary of approximately 9.15% in Canada (UHY, 2016), making the total cost to MITI for each worker is $54,044.97. At 500 workers the cost would be $27,022,483 annually. For a total of 6 years, the total average cost of construction labour would be approximately $162,134,902.

The Environmental Assessment notes that the effects of the operation will provide 1750 person years directly, with an included 2100 person years of indirect employment. While these jobs would be considered more permanent than those in construction, the study

contends that given the decline of 10% in the population over the past few years, there is ample infrastructure to support some families coming to fulfill positions that cannot be filled locally. Since "most of the infrastructure and business capacity is underutilized, it is anticipated that new business opportunities caused by the Project could be filled by the existing population." (AMEC, 2008) With expectations of more than 240 permanent full time jobs, this is what the region would benefit greatly from. (Myrden, 2010) MITI did provide me with an estimate for the number of positions (see Figure 7 below) and these figures suggest more jobs than this, and perhaps it is because they are not fulltime, or that the 240 jobs references by Myrden corresponds closely with the 265 with phase 1 of the terminal. Administration personnel will start with 25 in 2016 and this figure will double by the start of phase 3 in 2022. Weekly earnings in the administration and support field in Nova Scotia were $644.56 in 2015. (Cansim Table: 281-0063, 2016) This puts the annual salary at $33,517.12. Adding the 9.15% premium to the cost of employees the total annual estimated cost of administration personal is $36,583.93. At 50 total administrative employees, the annual cost to the firm will be $1.829M.

The operations will be at the heart of the terminal working in unison with the AGVs to ensure containers are quickly handled to their destination. It is for this reason even with all of the technology that the operations staff represent the largest portion of labour within the terminal. The weekly earnings in the transportation and warehousing industry in Nova Scotia is $948.83 in 2015. (Cansim Table: 281-0063, 2016) Making an annual salary of $49,340, and cost to the firm of $53,853. The first year it is expected that there

will be 175 operations staff, increasing each year to a total of 415 staff in 2024. The total annual cost with 415 operations employees will be $22.349M.

The other part needed to keep everything moving along are the technical staff, who are responsible for maintaining the capital equipment to ensure that there is as little down time as possible. These positions are highly skilled with specific knowledge of the equipment required and thus they have a high weekly salary of $1,163.35 as based on the professional, scientific and technical services. (Cansim Table: 281-0063, 2016) The annual salary of $60,5494, and a total cost of $66,029. The technical department will start out with 50 staff, doubling to 100 in phase 3, with the total cost associated with technical staff reaching $6.603M per year.

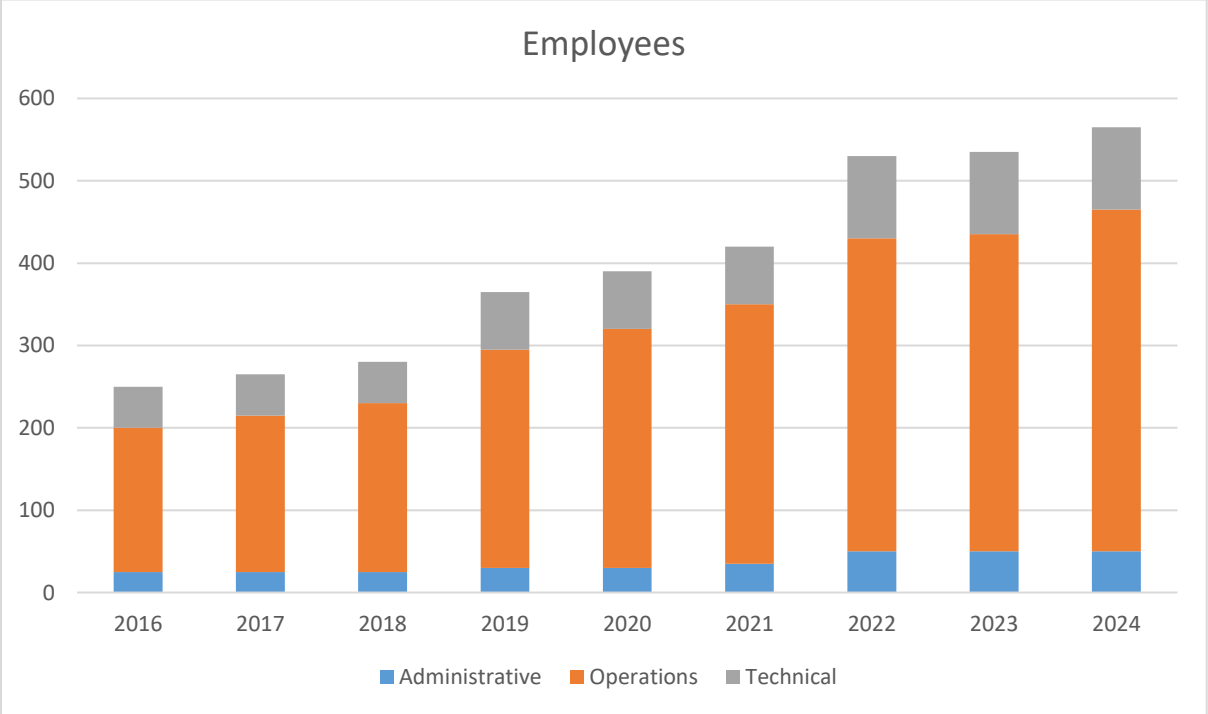


Figure 7: Number of Employees per year

In summary, there are going to be two types of employment, those that are short term in the construction of the terminal, and those permanent positions that will run the terminal. There will be 500 construction jobs, that will greatly benefit the region, but some of the workers will come from other communities. The total estimated cost of construction staff is $162M. The terminal staff will grow throughout the growth of the port, to a total staff complement of 565 by 2024. The total cost of terminal staff year over year in 2016 dollars is $184.6M.

2.4 Benefits

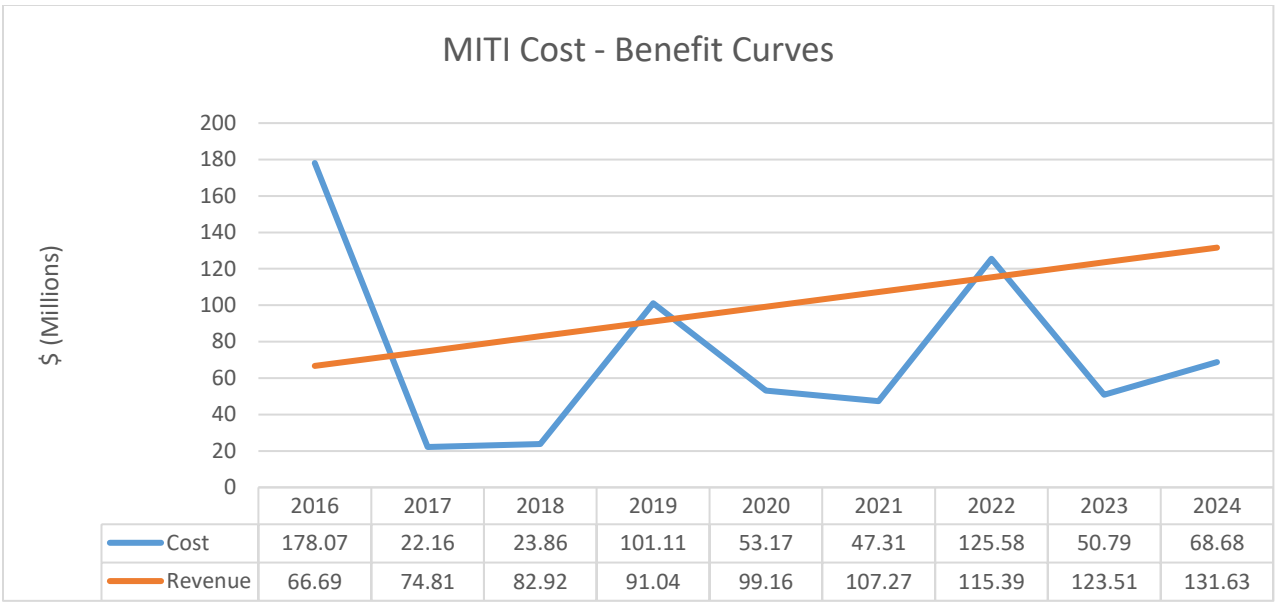
The World Bank estimates the cost to export and import in US$ per container. In 2014 for Canada the cost to import a container was estimated at $1680. (The World Bank, 2017). Note the World Bank estimates the price of export in Canada is the same as import. With an average exchange rate of 1.105 in 2014 (Bank of Canada, 2017), the estimated cost of importing a container in Canadian currency is $1,856.40. These costs are associated with importing a TEU and include, “documents, administrative fees for customs clearance and technical control, custom broker fees, terminal handing charges and inland transport,” note that cost of sea transport is not included. (The World Bank, 2017) Unfortunately, there is no breakdown available for how these fees are distributed, so as part of the analysis I will look at 3 profit rates, 5%, 3%, and 2%. 5% or $92.82 is what matches closest to revenues ($53 Million for 600,000TEU) reported by Prince Rupert Port Authority, insofar as the number of TEUs handled and the reported profits are closest. (Prince Rupert Port Authority, 2015) Table 1, below outlines the annual revenue at these profit rates. Given that 5% matches closest with Prince Rupert it will be

the rate used for this exercise, though it is acknowledged that the profitability relies heavily on terminal seeing the projected estimates.

Table 1: Projected Revenue

Year	TEU	2%	3%	5%
2016	760000	$26,676,000	$40,014,000	$66,690,000
2017	852500	$29,922,750	$44,884,125	$74,806,875
2018	945000	$33,169,500	$49,754,250	$82,923,750
2019	1037500	$36,416,250	$54,624,375	$91,040,625
2020	1130000	$39,663,000	$59,494,500	$99,157,500
2021	1222500	$42,909,750	$64,364,625	$107,274,375
2022	1315000	$46,156,500	$69,234,750	$115,391,250
2023	1407500	$49,403,250	$74,104,875	$123,508,125
2024	1500000	$52,650,000	$78,975,000	$131,625,000

The TEU estimates are based on the numbers that were disclosed in the Environmental Assessment as starting with seeing 95 to 150 ships averaging approximately 8,000 TUEs for a total of 760,000. Additionally, they reported at full operation they expect that the number of vessels will increase to 188 to 250 depending on the size of the vessels, but that the total number of TEUs would be 1.5 million. (AMEC, 2008) To get annual estimates between the beginnings of the project until full operation I took an average of the difference between the two, and added for constant growth from 2016 to 2024. This netted a year over year increase of 92,500 TEU or a 12% increase between years 1 and 2, and a 6.6% increase between years 8 and 9. As a result the revenue stream in constant as can be seen in Figure 8 represented by the orange curve. If we then add the cost curve blue) by year, it is possible to see the large capital investment at the beginning of the project (2016), as well as spikes for the other two phases (2019, 2022). It is clear that based on these figures that the investors will see a return on their investment.



	2016	2017	2018	2019	2020	2021	2022	2023	2024
Cost	178.07	22.16	23.86	101.11	53.17	47.31	125.58	50.79	68.68
Revenue	66.69	74.81	82.92	91.04	99.16	107.27	115.39	123.51	131.63

Figure 8: Melford Terminal Projected Costs and Earnings

Once the firm does begin earning profits they will be required to pay the crown taxes. The effective corporate tax rate for the province of Nova Scotia is 16.7% and 20.1% for Canada in 2016. (Bazel & Mintz, 2016) There is also a municipal property tax at $0.61 per $100. (Municipality of the District of Guysborough, 2016) The effective rate in Nova Scotia has fluctuated over the past few years, but for the working assumption for this paper will be that the rate will hold true at 16.7% in Nova Scotia and 20.1% federally for the next 9 years. Due to losses, and the ability to carry them forward, the firm will not begin to pay corporate taxes until 2018, when the firm beings to see positive cash flow. Table 2 identifies the revenue generated as well as the reported profits though carrying losses forward. Or what the figures will look like when reported for tax purposes. The surplus of 2018 is short-lived as they enter Phase 2 and post a loss in 2019. They will again pay taxes in 2020 and 2021 until the implementation of Phase 3. As the terminal reaches full operation they start to see larger profits and therefore are paying taxes. Once

the terminal is fully operational they will continue paying maintenance fees and labour, however there should not be any major capital expenditures occurring so the governments can expect to see similar tax returns for a number of years. During the assessment phase of this paper it is expected that MITI will pay the provincial government $37.0 Million and the federal government $44.6M for a total of $81.6 Million.

Table 2: MITI Profit and Taxes as Reported for Tax Purposes ($ Millions)

	2016	2017	2018	2019	2020	2021	2022	2023	2024
Revenue	$66.69	$74.81	$82.92	$91.04	$99.16	$107.27	$115.39	$123.51	$131.63
Profit	-$111.38	-$58.74	$0.32	-$10.07	$35.91	$59.96	-$10.19	$62.53	$62.94
Mtax	$0.12	$0.12	$0.12	$0.12	$0.12	$0.12	$0.12	$0.12	$0.12
Ptax (16.7%)	-	-	$0.05	-	$6.00	$10.01	-	$10.44	$10.51
FTax (20.1%)	-	-	$0.07	-	$7.22	$12.05	-	$12.57	$12.65
Total Tax	$0.12	$0.12	$0.24	$0.12	$13.22	$22.07	0.12	$23.01	$23.16
Net Profit	-$111.50	-$58.86	$0.20	-$10.19	$22.58	$37.78	-$10.31	$39.40	$39.66

Figure 9 shows the annual profit based on annual revenue and annual costs. At 5%, the firm should begin to see a return on their investment almost immediately. However, this is short lived because 2019 is the start of Phase 2 and another large capital investment will have them posting a $10 Million loss, and the firm will see a similar loss at the start of Phase 3 in 2022. The years without large capital investment do present themselves as profitable, ranging from $30 to $50 Million. It should be noted that even if the price per TEU were to be less, the project is still viable. At 3%, profit will not be realized until after the terminal has been fully operation for another 4 years (2028), and at 2% the project would likely never be profitable.

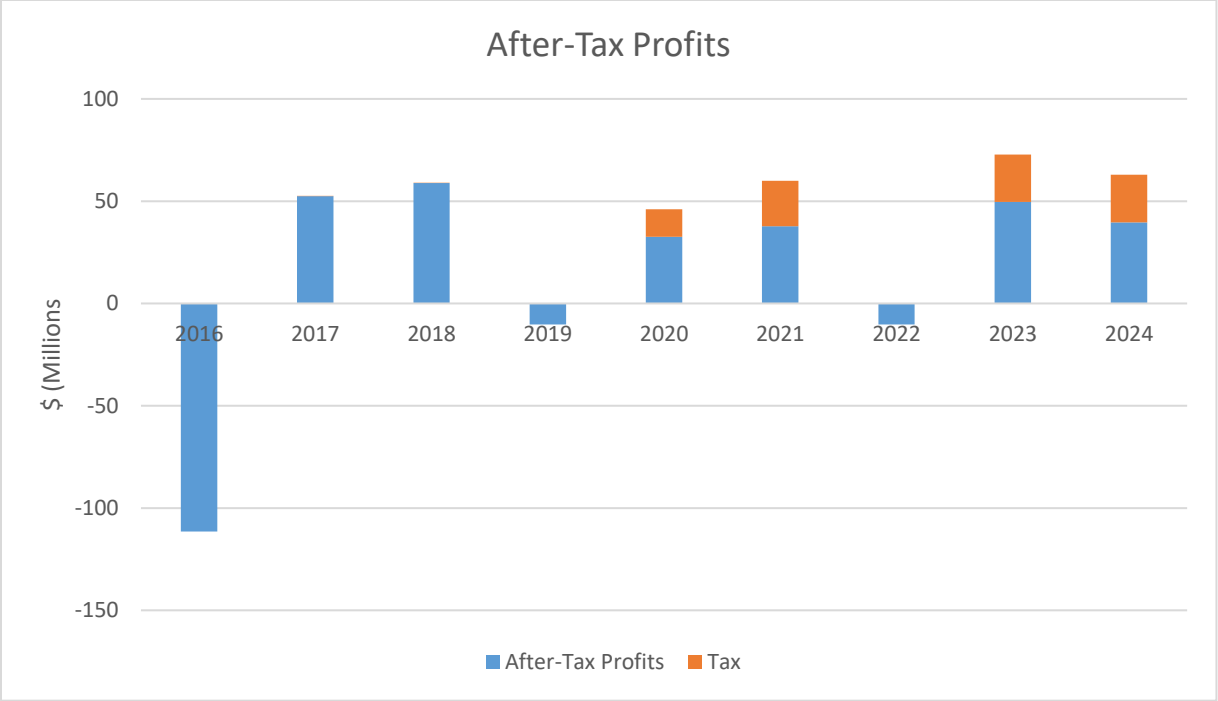


Figure 9: After-Tax Profits

CHAPTER THREE PUBLIC BENEFIT

Chapter 1 looked at the history of trade in the region and Chapter 2 focused on the costs associated with building the terminal as proposed, with their container projections. Chapter 3 will broaden the scope of the enquiry and analyse costs and benefits external to MITI. In particular, it will study what impacts will this container terminal have on the surrounding area, as well as the economy, jobs, more money coming into a poorer region, as well as the traffic and pollution that will be introduced.

3.1 Benefits to the Community

As we have discussed, this is not a traditional CBA as it is not a public project. Private investors are building, running, and maintaining the terminal. The concessions by governments appear to be minimal beyond the land purchases and for this reason the following section will focus on presenting the positive and negative benefits to the community.

3.1.1 Positive

To appreciate the impact that Melford International Terminal will have on the community of Guysborough County it is important to look at the demographics of the region. First, the population is in decline, to a tune of 10.1% between census years 2006 and 2011 (Nova Scotia Federation of Agriculture, 2011), and another decrease of 6.4% from the early results of the 2016 census for a total current population of 7,625 residents. Secondly the unemployment rate for the County is among the very highest in Canada at a

staggering 14.4 percent. (Employment Insurance, 2017) The total working population, based on 2011 data, is 1,645 people (Catalogue Number 99-012-X2011062, 2011), and of those roughly 60% work in the region; the rest work in neighboring counties and only 3.45% commute to Halifax. (Catalogue Number 99-012-X2011032, 2011) In such a depressed region, it is easy to conclude that any investment in the area is a good thing. Established ports have a substantial impact on their local economies. The value added in Rotterdam in 2007 was 10% of regional GDP, in Le Havre / Rouen this reached 21% of the regional GDP. The ports cluster of Antwerp represented of 3% total GDP in Belgium. (OECD, 2014) It must be noted that the scale of these ports are enormous in size compared to any Canadian Port, with Rotterdam seeing 12.3 Million TEUs in 2014 (World Shipping Council, 2017) and Port of Le Havre handling 1.94 Million TEUs. (HAROPA, 2015) In contrast, all Canadian Port Traffic in TEU's for 2014 was 5,578,006. (The World Bank, 2017) Thus, while it is true that these ports are significantly larger in size, stripping away the magnitude of these ports and focusing squarely on their significant role to their regional economy we can make the assumption that the situation would be comparable in Guysborough County and Nova Scotia and for that reason I have used the average of the Leontief multipliers below.

Economy

The Melford Environmental Assessment provides some estimates to the economic contributions to Nova Scotia's GDP in construction, $330Million, and $240Million based on year one operations of the terminal. This figure is extended to an additional

$170Million in construction and $40Million from port operations to the rest of the country. (AMEC, 2008)

The indirect economic effects or backward linkages can be quite substantial, estimated at between 1.13 and 2.47. These values are Leontieff multipliers fashioned by, “integrating port clusters into national input output-tables and assessing the inputs and outputs from the port cluster economy.” (OECD, 2014) For every $1 directly spent by the port, it is expected that a value of $0.13 to $1.47 of indirect economic activity is created. The lower multipliers were explained for those very large ports in small countries, where the indirect benefits are likely to spill over into neighboring countries. (OECD, 2014) As this is not the case for Melford, it is more likely that the backward linkages would be expected to be somewhere around the average of the range. The report identified that the strongest link with the following industries to ports were: Transport, storage, communications, coke, refined petroleum, nuclear fuels and chemicals. Nova Scotia already has close ties to most of these industries, including some pre-existing economic activity in the area such as the Nustar Terminals Canada Partnership, dealing in petroleum, on the other side of the Strait in Cape Breton.

The public will also benefit in terms of the taxes paid to the crown, which can then be invested into public goods. As established in Chapter 2, the effective tax rate for the province of Nova Scotia was and is being assumed to hold at 16.7% and the Canadian corporate tax rate to hold at 20.1%. (Bazel & Mintz, 2016) As the firm will be operating at a loss for the first years, it is not until Year 3 that the province will see any money, but

in this year, it is estimated at $13. 4 Million. This amount will increase year over year if traffic predictions are correct for a total of $36.9 Million in 2024.

The contribution to regional GDP can be estimated based on the cost to import or export in Canada, estimated at $1,680 USD in 2014 (The World Bank, 2017), which is $1,755 CDN for the same year. (Bank of Canada, 2017) This value represents all of the costs with importing or exporting a container including customs fees, clearance, technical control, brokers fees, terminal handling, and inland transport. (World Bank, 2016). A reminder that it was estimated above that the port only received 5% of these fees. At the end of the construction project estimates that they will handle 1.5Million TEUs per year (AMEC, 2008), for a total estimate of $1.3 Billion in direct GDP contribution. Further using the average of backward linkages multiplier of 1.71 from the OECD would add an additional $934M for a total of $2.25Billion. With the GDP of Nova Scotia in 2014 at $37.66Billion (Cansim Table: 384-0038, 2015) it is clear that even if the estimates are optimistic, there is substantial economic benefit should the firm be successful. In contrast the port of Halifax has published that the port directly generates $703 Million in direct revenue and a further $958 Million indirectly, making for a total contribution of $1.66 Billion, (Chris Lowe Group, 2017)

Another benefit to the regional economy is going to be a link into the rail and additional road that will connect into the terminal and logistics parks, these investments in infrastructure are which will make the area more accessible for the shipment of goods. In addition to the area designed for use by MITI, there is the Melford Industrial Reserve,

which will allow for more businesses to enter the market in the area, having infrastructure brought to this area will facilitate their entry.

While forward linkages are sparse with a container terminal, the most important benefits to consumers and businesses is opening a trade corridor between Asia and the Mid-West. Arguably these links already exist through Halifax, however the ability to have the transload facility closer to a developing area will mean more access at higher volumes. As with any economic activity, it is assured that the crown will get its share, in the form of taxes. This is where the real public benefit will come from at the municipality, provincial, and federal level. It was noted in the consolidation of the land purchase that MITI paid for city expenses, realizing a net benefit of zero to the public. Starting with the municipal income, MITI has paid the appropriate land transfer taxes of 1% of value, with a value of $20M assessed in Chapter 2, the land transfer tax to the municipality of $200,000. In addition to this the Municipality can expect to capitalize on an annual payment of property tax to a tune of $0.61 per $100, when the project is complete that would mean a minimum of $122, 000 not accounting for the increased valuation based on the development of the land. (Municipality of the District of Guysborough, 2016) Though the municipality will not realize as much tax revenues as perhaps other area's in the country, for the same reason the developers find the area appealing, "with the lowest residential tax rate in Nova Scotia and a very competitive business/commercial property tax rate." (Municipality of the District of Guysborough, 2016) As noted in Chapter 2 the firm will be paying 16.7% provincial tax and 20.1% federal tax and thus the firm is

expected to pay the provincial government $37.0 Million and the federal government $44.6M for a total of $81.6 Million for the time period assessed.

Labour

In terms of jobs, the project will be a shock to the economy in an extraordinary scale. The 500 anticipated construction jobs will come from outside the county as expected, particularly since there are currently only 35 carpenters, and 20 heavy equipment operators. (Catalogue Number 99-012-X2011062, 2011) Any benefit to the region in these positions will be from the commuters spending money locally for work, possibly having some of them move to the area, reversing or at minimum slowing the downward population trend.

Looking towards terminal jobs, the first-year estimates 25 administrative staff, 175 operations, and 50 technical for a total of 250. This figure represents 15% of the working population in 2011, this will have a considerable impact on the region's employment balance. While the unemployment rate is high and there are people able to work, 13% of the employed population work in the fisheries. (Catalogue Number 99-012-X2011062, 2011). By year 9 the total staff complement is expected to grow to 565 total jobs, 50 in administration, 415 in operations, and 100 technical jobs. All of these will be considered good jobs for the region, when the terminal is fully operational it will add an additional $29 Million a year in the form of wages to the economy.

The measurable benefits will come in the forms of the salary earned by employees. The total cost to the firm will be divided into two main benefits, directly to the workers and where they spend their income and in the form of income tax. The Province and Federal Government will see a bump through the income tax paid by employees both through the construction phase and the permanent employees, from previous unemployed persons, in turn it is likely to see transfer payments lessen due to less people requiring social assistance (and other transfers dependent on income, like family allowances, etc.).

3.1.2 Negative

On the other hand, the economic growth is not occurring in a vacuum and it is important to identify the losers as well. The most obvious negative economic benefit to the region is the potential impact that MITI could have on the Port of Halifax. It has been stated in nearly every publication that MITI is not looking to compete with Halifax. However it is virtually impossible for this to occur. Given the proximity of the port and the competitiveness based on MITI's private status, it is foreseeable that Halifax could lose some business to the new port. Working with the assumption that Melford is only going after the Midwest ports, it is possible to establish an estimate of the impacts based on the 2015 figures replaced by the Port of Halifax. According to these figures the Port of Halifax imported 209,904 TEU and exported 208, 455 TEU for a total of 418,359 TEU. The estimated share of mid-west trade is 29% and 11% respectively, or 60,872 and 22, 930 for a total of 83, 802 TEU, roughly 20% of the ports container traffic, and 17.8% of

total cargo volumes. (Halifax Port Authority, 2015) If all of this port traffic were to switch from using Halifax to Melford International Terminal, it would have a devastating impact on the local economy of the Province's Capital.

It is important to put this impact in context, "because of its small market size, Halifax is viewed by many in the industry as a 'discretionary port'. It serves the local market in Atlantic Canada, and has a small share of the Quebec, Ontario and U.S. Midwest market." (Frost J. D., 2010) Supporting this is the sheer volume of containers, in 2009 Chicago handled 13,887,000 TEU compared to 344,000 in Halifax. (Hull, 2012) Based on the estimate above of 20% of Halifax's container's heading to the mid-west, that would mean only 68,800 TEU and roughly 0.5% of Chicago container traffic. Hull contends that Melford will compete directly with Halifax, which is currently only operating at 50% capacity. The implications of this competition is unclear, and perhaps there is room for both ports to service Chicago's huge 14 Million TEU and growing market. There are several ports in the United States on the eastern seaboard that are operating at a much higher capacity and face problems of congestion, dated capital equipment, and aggressive labour unions. In the short term, it is expected that Melford will be targeting new traffic, using partner SSA Marine to leverage its existing relations on the West Coast to open up an eastern corridor. It is unlikely that all shippers that use Halifax would switch immediately, but it could pose a longer-term issue where by Halifax may have to focus its efforts to focus on serving the local Atlantic Canadian Market, should Melford be successful in acting as Chicago's seaport. Regardless, the largest potential magnitude of this occurring is mentioned above, about 20% of container

business, while there is still room for both ports to coexist and serve the large Mid-West market. The potential impact is not as dramatic though, as Halifax is fairly well diversified as seen in Chapter 1. So, at 20% Halifax would fall 83,672 TEUs, and if we use the same 5% figure to estimate the value of a TEU, it would be a loss of $7.3Million of the port's $703Million direct economic impact. (Chris Lowe Group, 2017) This is relatively small because the Port of Halifax is very diversified, through breakbulk cargo, cars, oil, cruise ships, among other business lines.

Another key negative economic impact is that dealing with the environment. These impacts can be separated into two distinct categories, the first being the transformation of the land from an almost unblemished nature scene, scattered with a few homes to an industrial transportation hub. The second is caused through the operation of the terminal, through the introduction of large shipping vessels, trains, trucks, and other equipment. The damage done to the environments from ports tend to be: air emissions, water quality, soil, waste, biodiversity, and noise. Shipping by sea is the most efficient method of transporting cargo, at 514 miles/gallon for 1 ton of cargo, vs. 202 miles/gallon by train and 59miles/gallon by transport truck. (Tennessee-Tombigbee Waterway, 2016) Still, the magnitude of ships can represent a large share of total emissions in a port, such as Los Angeles where the emission from ships represents 45% of all sulphur dioxide emissions. Water quality is a concern, particularly related to the potential spills of petroleum products that occur though the normal port activities, accidents, and illegal dumping practices. The soil pollution is related to operations on land, similarly to that of the water pollution. Waste occurs because these ships bring toxic sludge and general garbage from

the operation of the ships and the crews, responsible vessels bring the waste to port where it can be disposed of appropriately. Bio diversity is affected by all of those pollutants mentioned above, but also because of the nature of international shipping, strange species transplant themselves from one region to another by catching a ride on of these container ships, potentially competing with local species and changing the ecosystem irreparably. Finally, noise pollution exists through the very existence of heavy industrial work, the difference with ports being that they never stop, fortunately the port is not located in a downtown core and this impact will be minimal, until which point, houses start popping up within proximity of the port. (OECD, 2014)

The Environmental Assessment did outline possible environmental disturbances, however is was deemed that the land is not in a place that is particularly special, likely part of the reasoning for its original zoning in the 1970s as an industrial reserve. The report elaborates, “A review of the Nova Scotia Department of Natural Resources significant habitat database revealed that no significant habitats are known to exist within the footprint of the proposed project, including rail and transmission corridors.” (AMEC, 2008, pp. ES-2) Furthermore the assessment contends that after all of the various mitigation tools are in place the residual adverse effects are not significant for regular activates and that the, “likelihood of occurrence of any of these [accidental] events and associated effects are unlikely.” (AMEC, 2008, pp. ES-7)

There could be concern that local businesses may lose their employees as they seek better paid or full time work at the terminal. However, I do not believe that this should be a

concern based on two factors: the high unemployment rate coupled with the expected increase in activity in the area that could help increase business for the local shop owners. With that there will also be a larger impact on the infrastructure, with the large construction vehicles, the increased commuter traffic, and the local traffic going to the terminal there will be an increased stress on existing infrastructure. At present, there is a 2-lane highway in the area, while the increased volume would not warrant an investment in widening the highway, the traffic will mean that the government will have to spend money sooner to maintain it. Ultimately most cargo is expected to be going by rail and therefore the impact of increased congestion is no significant.

Alternative Uses

Considerations related to alternative uses were touched on briefly in the previous chapter, but I wish to take a moment to focus on a few alternate outcomes of various aspects of the project. Where this is a private venture it is assumed that the investors expect that the project will warrant a profitable return, and that is the reason they are moving forward. This section simply looks to look at the other side of the coin and explore the opportunity cost of going ahead, the "what could have been".

Perhaps the most obvious scenario is related to the land. The majority of the space is a greenfield site, meaning it is untouched, however the Nova Scotia government has already designated 14,500 on site as an industrial reserve ready for, "heavy industrial and commercial development." (Nova Scotia Business Inc., 2016) Though development hasn't been quick in this area, as it was originally designated for a planned oil refinery in

the early 1970's which did not come to fruition. While MITI has purchased these crown lands for the development of the project, the land will revert back to the crown, should they fail to develop, leaving the land available for the next bidder, and not seeing the potential benefits of selling this land that could occur if the project succeeds. There have been other parties interested in the industrial reserve to date including such as liquefied natural gas companies, H-Energy and Pierdale Energy Canada Ltd. (Taylor, 2013). It therefore is suggested that the alternative use of this land would not increase the benefit to the public as much as if the project were to be successful.

There is some land though that required the sale of private residences to MITI via the Municipality of the District of Guysborough. The Municipality spent nearly 8 years to put the necessary package together including the expropriation of land and deals for private sale, while the Municipality financed the efforts associated with acquiring the land, MITI has reimbursed them as part of the sale agreement. (Taylor, 2013) The particulars of these deals are not available. Despite my best efforts to reach out to the Municipality, reporters, politicians, and the like no one would share any information with the deal citing it was "confidential". So all I have to go on is reports that fair market value was paid for the property, but it would be safe to assume that there are some residents who would have preferred to stay in their homes, as suggested by the need to expropriate land. In addition to this, there were approximately 60 private properties that needed to complete the rail corridor (Taylor, 2013), and council minutes' move that the land be acquired by council for MITI. Thus, the public benefit to those who were forced to sell their land or those who will now find themselves adjacent to the project will be negative.

3.2 Is the Community Better Off?

Neoclassical economics teaches us that firms will seek to maximize profits, I have demonstrated in Chapter 2 that this project should be profitable to the firm as it becomes fully operational within nine years of breaking ground as long at the container traffic hypotheses holds true. This paper seeks to go beyond assessing the viability of the firm and look at the scenario from a regional development perspective, answering the question of whether or not Guysborough County, Nova Scotia will be better off should the Melford Atlantic Gateway be built and bring millions of containers and ships from around the globe into this small relatively rural community.

Guysborough Country has seen a decrease in its population over the past number years, and has a high unemployment rate. Even though the project is looking to minimize labour through the use of modern technology, this works well for the region, where it would provide a boost in employment, the 565 anticipated jobs, for a population that has 1,067 people unemployed. As opposed to a complete shock that would cause significant pressure on the community, with a population of 7,625 if the number of employees of the port of Halifax (12, 446) (Chris Lowe Group, 2017) were required for the operation. The new jobs will provide employment to those willing to work and should not have much of an impact on local businesses. Should some businesses lose their workers to the terminal, there are those seeking jobs who should be able to replace them, and as a result the more people who are working should be able to spend their new and / or higher wages at these same businesses.

The building of the port should also bring other businesses to the Melford Industrial Reserve, so in addition to the direct economic contribution through jobs and investment, there is longer term growth potential. Throughout the project taxes will also be paid at all levels of government, which will in turn be able to be reinvested in a reenergized region, as firms start up there may be more jobs, and the decline in population may halt and start to increase. Linkages will also be created with the destination of the containers; local manufactures will be able to use the terminal to export their goods inland via the rail connection or put their wares on the ships overseas. While this is already possible through the port of Halifax, the cheaper land and lower property taxes may allow for greater competition.

With any project, where there are winners, there of course will be losers. At Melford the most directly impacted people will be the 30 fisherman and crew that set their traps where the terminal is to be built. (AMEC, 2008) We discussed the potential loss of business to Halifax should carriers divert their American bound cargo to MITI. While this loss is not insignificant, the shift would result in essentially the same economic contribution to the Province. Perhaps the largest negative impact will be on the environment, bringing ships from around the world into the Canso Strait will add to the traffic and make it more difficult for smaller vessels to navigate. The terminal is bringing industrial operations to a greenfield site, and will act as another case where man has irrevocably changed the landscape. Though the government approved environmental assessment has assured us that there were no significant habitats known to exists on the

location and that several mitigation tools will help to ensure that regular operations and accidents have no further environmental destruction than planned.

Overall, I believe that the community will be better off with the introduction of Melford Terminal. It will create much needed jobs, draw businesses to the region and help not only the local economy but also that of the province, which has seen troubled economic times for the past number of years. And while the peaceful shoreline may lose its natural beauty, the residents will experience unprecedented economic growth, and some of the benefits that come along with being an important link in the global supply chain.

CHAPTER FOUR CONCLUSION

The purpose of this paper was to look at the viability of a privately held container terminal which is proposing to be built along the shore of the Canso Strait in Guysborough Country Nova Scotia. The method chosen to do this was a Cost-Benefit Analysis, noting that some liberties would need to be taken as traditionally this method is used on public projects or policies. The advantages of this approach allow for a discussion, which otherwise may not have occurred based on what are the expected outcomes for the community where this major investment is expected to be built.

First I looked at the historical context of Nova Scotia, which has been largely shaped by the sea. At one point in time the province had strategic North American ports for both the French and the British. While the military has, and continues to play a significant role in the Province's capital, international trade has grown in its importance as many players are trying to grab a lucrative spot as being a part of the global supply chain. World container traffic is continuing to rise, and traditional ports are reaching capacity or are plagued with congestion of traditionally being at the city centres.

Melford International Terminal Incorporated is offering a solution to these problems by creating a new terminal that is relying on modern technology. It doesn't face any legacy issues, such as port layout, and can take advantage of a purpose-built facility. Furthermore, there are no existing labour unions to contend with and thus bringing in machines to do the work of humans will not be a concern, though jobs will still be created

as there are some aspects of operation which simply can't be automated. The firm is looking to capitalize on relatively cheap land and property taxes outside the urban centre, and take advantage of a retired rail corridor to move goods from around the globe to the U.S. Midwest and back again. I modeled the costs of the terminal based on the advanced equipment that has been proposed and evaluated the potential profits to independently evaluate whether the claims made by the terminal made sense, and they did showing that the firm will be profitable prior to being fully operational, however the largest dependency is on the container volumes, failure to hit the targets will put the terminal in jeopardy.

After it was determined that from the firm's perspective the project could be viable, I explored the impacts on the surrounding community. Guysborough County is a community 7,600 people and more than 14% of them are unemployed. The potential to bring more than 500 jobs to the region, and the expectation of more business at the Melford Industrial Reserve is certainly appealing. There are opportunity costs though, with economic progress comes environmental sacrifice. Residents who for all their lives looked at fishing boats crossing their waters may start to see massive container ships.

This research has taken a deeper look at the proposed Melford International Terminal Incorporated project. Because this is a private project, a different level of scrutiny is placed on it, and information is much more difficult to find compared to a public project. I believe that is the advantage of using a traditionally public tool and applying it in this way. While there are different moving parts, in the form of private money and profits,

there is still an impact on society. Originally, I had suspicions that things were not on the up and up and that governments may have been making concessions for the desire of creating work where there is a dire need, but in through my research I have learned that the firm has been paying fair market price, and the location was designated for industrial use decades ago. This project has the potential to substantially change Guysborough County for the better by employing those who are not in good paying jobs. The increase in global trade continues to increase and if building a terminal in a remote location to service large cities works, it may become a model for other ports around the world.

The key figure in this assessment is based on container traffic, and is likely the reason why the project has yet to break ground. $40 Million dollars have been spent to date preparing for development. (The Chronicle Herald, 2016) The developers must ensure that they have carriers on board to achieve the container traffic necessary to be viable. MITI desires to be competitive with major traditional ports and to do so they want to keep costs down, but in doing so, the volume is critical. Additionally, many of my estimates were pieced together from various sources to complete a simplified model that does complete the task, but in having access to data from the firm, municipal and provincial governments it would be a more accurate evaluation.

Upon completion of this paper, I believe that Melford International Terminal is a viable and worthy project. The state-of-the-art technologies will ensure that Nova Scotia will continue to play an important role in the North Atlantic region. Guysborough County stands to gain and should make the region richer.

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APPENDIX A: Additional Tables

TABLE A: Capital Input Quantity on Site by Year

Year	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Project Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Quay Cranes	4	4	4	7	7	7	10	10	10
Rail Mounted Gantry Crane	10	10	10	15	18	18	24	24	24
Terminal Tractors	2	2	2	2	2	2	2	2	2
Truck Cranes	1	1	1	1	1	1	1	1	1
Standard AGV	26	27	27	43	46	49	65	65	68
Lift AGV	3	3	3	4	5	6	6	6	7
Railway Cranes	3	3	3	4	5	6	7	7	8
Fork Lifts	2	2	3	3	4	4	5	5	6

TABLE B: Capital Input Costs by Year (Millions $)

Year	Unit Cost	2016	2017	2018	2019	2020	2021	2022	2023	2024	
Project Year		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Total**
Quay Cranes	10.64	42.55	-	-	31.91	-	-	31.91	-	-	**106.37**
Rail Mounted Gantry Crane	2.84	28.36	-	-	14.18	8.51	-	17.02	-	-	**68.07**
Terminal Tractors	0.13	0.26	-	-	-	-	-	-	-	-	**0.26**
Truck Cranes	3.55	3.55	-	-	-	-	-	-	-	-	**3.55**
Standard AGV	0.71	18.44	0.71	-	11.35	2.13	2.13	11.35	-	2.13	**48.22**
Lift AGV	0.78	2.34	-	-	0.78	0.78	0.78	-	-	0.78	**5.46**
Railway Cranes	5.67	17.02	-	-	5.67	5.67	5.67	5.67	-	5.67	**45.38**
Fork Lifts	0.50	0.99	-	0.50	-	0.50	-	0.50	-	5.67	**8.15**
Total		**113.50**	**0.71**	**0.50**	**63.89**	**17.59**	**8.58**	**66.44**	**-**	**14.25**	**285.46**

TABLE C: Labour Quantity of Positions by Year

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024
Administrative	25	25	25	30	30	35	50	50	50
Operations	175	190	205	265	290	315	380	385	415
Technical	50	50	50	70	70	70	100	100	100
Total	**250**	**265**	**280**	**365**	**390**	**420**	**530**	**535**	**565**

TABLE D: Labour Cost of Employees by Year (Millions $)

Year	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Administrative	0.91	0.91	0.91	1.10	1.10	1.28	1.83	1.83	1.83
Operations	8.63	9.37	10.11	13.08	14.31	15.54	18.75	19.00	20.48
Technical	3.30	3.30	3.30	4.62	4.62	4.62	6.60	6.60	6.60
Total	**12.85**	**13.59**	**14.33**	**18.79**	**20.03**	**21.44**	**27.18**	**27.43**	**28.91**