

SAMMANFATTNING

| | |
|--------------------|---|
| Titel: | The Panama Canal – An Expanded Analysis |
| Författare: | Olof Orstadius |
| Handledare: | Ingela Elofsson, <i>Institutionen för produktionsekonomi</i> , Lunds Tekniska Högskola Markus Lindbom, <i>Commercial Operations</i> , Stena Bulk |
| Problemdefinition: | Expansionen av Panamakanalen är en extern faktor på tankerfraktmarknaden som görs för att ändra fraktvolym, kanalavgiftsinkomster, medelgenomfartstiden och för att eventuellt ändra eller skapa nya lönsamma transportvägar. De rederier som opererar i regionen kommer att, på ett eller annat sätt, påverkas av detta. Utmaningen för tankerredierier som Stena Bulk är att skapa en robusthet för den framtida utvecklingen på tankerfraktmarknaden, det vill säga en medvetenhet och förståelse för de möjligheter och risker som skapas av expansionen. |
| Syfte: | Syftet med detta examensarbete är att beskriva och analysera utvidgningen av Panamakanalen för att skapa ökad robusthet för den framtida utvecklingen på tankerfraktmarknaden. |
| Metod: | Studien har genomförts med hjälp av scenarier och de två första stegen i TAIDA TM -modellen; tracking och analysing. Den kvalitativa insamlingen av primär empirisk data har huvudsakligen gjorts genom flertalet semistrukturerade intervjuer med olika viktiga aktörer på tankerfraktmarknaden. Sekundära data har samlats från skrivna dokument såsom litteratur, artiklar och digitala källor. |
| Slutsatser: | Både Afra- and Suezmaxfartyg kommer att tillåtas passera den utvidgade kanalen och dessa större |

fartyg kan komma att ge rederierna nya lönsamma handelsvägar tack vare stordriftsfördelar.

Expansionen kommer också att tillåta ett större antal fartyg att passera genom kanalen och därmed nästan fördubbla kapaciteten. Den ökade kapaciteten kommer att innebära kortare medelgenomloppstider och därmed ökad pålitlighet, vilket sparar tid och pengar för rederierna.

Dessa huvudsakliga möjligheter kan summeras enligt följande:

- Stordriftsfördelar tack vare möjligheten att passera kanalen med Afra- och Suezmaxfartyg
- Nästan fördubblad kapacitet med ökad pålitlighet
- Kortare medelgenomloppstider tack vare minskad risk för förseningar

För aktörerna på tankerfraktmarknaden ger detta möjligheter till ökad handel men priset för detta är de kanalavgifter som rederierna betalar för att få passera genom kanalen. Den ändrade inriktningen av kanalmyndigheten mot en mer marknadsanpassad avgiftsstruktur och bättre service under det senaste årtiondet har lett till ökad tillförlitlighet till kanalen. Om denna utveckling bryts och myndigheten istället låter kanalavgifterna baseras på statens budgetutgifter innebär det en stor risk för att avgifterna skjuter i höjden, vilket kommer att påverka tankerfraktmarknaden negativt.

Det är också relevant att studera fokusering på hamnarnas infrastruktur. Om viktiga hamnar i regionen inte håller jämna steg med utvidgningen av kanalen kommer inte rederierna fullt ut kunna utnyttja stordriftsfördelarna.

En annan risk ligger i det faktum att kanalen kommer att frigöra tonnage i form av Afra- och Suezmaxfartyg som tidigare var fast på ena sidan av kanalen. Efter expansionen kommer dessa fartyg att bli tillgängliga på båda sidor om kanalen och på så sätt öka utbudet av tonnage och därmed minska priset på tankerfraktmarknaden i regionen.

Dessa huvudrisker kan summeras enligt följande:

- Ändrad kanalavgiftpolicy kan leda till att avgifterna skjuter i höjden
- Brist på hamninfrastruktur minskar fördelarna med expansionen
- Fler och större fartyg tillgängliga i regionen minskar fraktratena

Nyckelord:

Panamakanalen, utvidgning, scenarioanalys, tanker, fartyg, sjöfart, fraktmarknad

ABSTRACT

- Title: The Panama Canal – An Expanded Analysis
- Author: Olof Orstadius
- Supervisors: Ingela Elofsson, *Department of Production Management*, Institute of Technology, Lund University
Markus Lindbom, *Commercial Operations*, Stena Bulk
- Problem definition: The Panama Canal expansion is an external factor on the tanker freight market that is made to change cargo volumes, channel fee income, the average transit time and might also change or create new profitable transportation routes. Shipowners operating in the region will, in one way or another, be affected by this. For tanker shipping companies like Stena Bulk the challenge is to create robustness for the future development in the tanker freight market, i.e. become aware of and understand opportunities and risks created by the expansion.
- Purpose: The purpose of this thesis is to describe and analyse the expansion of the Panama Canal in order to create increased robustness for the future development on the tanker freight market.
- Method: The research has been conducted using scenario analysis and the two first steps in the TAIDA™ model; tracking and analysing. The qualitative primary empirical data has mainly been collected by numerous semi-structured interviews with various important actors in the tanker freight market. The secondary data was collected from written documents such as books, articles and digital sources.

Conclusions:

Both Aframax and Suezmaxes will be allowed to transit the expanded Canal and these larger vessels might give the shipowners new profitable trade routes due to economies of scale.

The expansion will also allow a larger number of transits through the Canal and thereby almost double the capacity. The increased capacity will generate a faster average transit time and thus increased reliability, allowing the shipping companies to save time and thus money.

These main opportunities can be summarized as follows:

- Economies of scale due to the possibility to transit Aframax and Suezmax through the Canal
- Nearly doubled capacity with increased reliability
- Shorter average transit times thanks to less risk of delays

For the actors on the tanker freight market this gives an opportunity to increase trade but the price for this is the tolls that the shipowners pay for transiting the Canal. The shift by the Canal authority towards a market oriented toll structure and better services during the last decade has led to increased reliability of the Canal. If this development is changed and a more state budget controlled toll policy is implemented there is a great risk that the tolls will soar which will affect the tanker freight market negatively.

It is also relevant to study the focus on the ports infrastructure. If important ports in the region do not keep up with the investments being made in the Canal the shipowners will not be able to fully take advantage of the economies of scale.

Another risk lies in the fact that the expanded Canal will release tonnage in form of Aframax and Suezmaxes that before was stuck on either side of the Canal. After the expansion these vessels will be available on both sides and thus increase the supply of tonnage and thereby lower the price on the tanker freight market in the region.

These main risks can be summarized as follows:

- Changed toll policy can lead to soaring Canal fees
- Lack of port infrastructure reduces the benefits of the expansion
- More and larger vessels available in the region lowers the freight rates

Key words:

The Panama Canal, expansion, scenario analysis, tanker, vessel, shipping, freight market.

PREFACE

This master thesis has been conducted in Lund during the fall of 2009. The aim of the report has been to describe and analyse the expansion of the Panama Canal in order to create increased robustness for the future development on the tanker freight market for shipping companies such as Stena Bulk. The report will hopefully serve as a base for the management at Stena Bulk in order to understand the upcoming situation with an expanded Panama Canal and a starting point in the work of meeting the opportunities and risks that is about to arise.

Before finishing the preface and moving on to the actual thesis, there are a couple of people I would like to thank. First, and foremost, a big thanks to my girlfriend Louise af Ugglas, who have supported me during my time in Lund. Thanks also to my family that have contributed in so many ways.

I would like to thank Gustav Eriksson who tipped me off about Stena Bulk and Ulf G Ryder; I am most grateful that you “let me in” in order to conduct my study.

I would also like to thank my tutors, Ingela Elofsson at Lund Institute of Technology and Markus Lindbom and Ulf Bäcklund at Stena Bulk for making this thesis possible.

Finally, I would like to take the opportunity to thank all of you who contributed to this thesis for taking time to talk with me, without your input this thesis would not exist.

Lund, November 2009



Olof Orstadius

TABLE OF CONTENTS

| | |
|--|-------------|
| SAMMANFATTNING | I |
| ABSTRACT | IV |
| PREFACE..... | VII |
| TABLE OF CONTENTS..... | VIII |
| TABLE OF FIGURES..... | X |
| 1 INTRODUCTION | 1 |
| 1.1 BACKGROUND AND PROBLEM DEFINITION | 1 |
| 1.1.1 Purpose | 3 |
| 1.1.2 Target Group and Delimitations | 3 |
| 1.1.3 Disposition of the Thesis | 3 |
| 1.2 ABBREVIATIONS AND TERMS | 5 |
| 2 METHOD..... | 7 |
| 2.1 METHODOLOGY | 7 |
| 2.1.1 Choice of Orientation..... | 8 |
| 2.2 RESEARCH METHODS | 8 |
| 2.2.1 Qualitative or quantitative research | 8 |
| 2.2.2 More About Qualitative Research..... | 9 |
| 2.2.3 Scenario Planning and Analysis..... | 9 |
| 2.2.4 Scenario Analysis Methods..... | 10 |
| 2.2.5 Choice of Scenario Analysis Methods | 10 |
| 2.3 DATA COLLECTION..... | 11 |
| 2.3.1 Interviews | 12 |
| 2.3.2 Written Documents | 14 |
| 2.3.3 Direct Observations | 15 |
| 2.4 SOURCES OF CRITICISM | 15 |
| 2.4.1 Reliability | 15 |
| 2.4.2 Validity..... | 16 |
| 2.4.3 Objectivity..... | 16 |
| 2.4.4 Criticism of Scenario Analysis | 16 |
| 3 THEORY..... | 19 |
| 3.1 SCENARIO ANALYSIS | 19 |
| 3.1.1 What is a scenario?..... | 19 |
| 3.1.2 Why do we need scenarios?..... | 20 |
| 3.1.3 TAIDA TM | 21 |
| 3.1.4 Preparation | 21 |
| 3.1.5 Tracking | 23 |
| 3.1.6 Analysing..... | 24 |
| 3.2 MARITIME ECONOMICS..... | 27 |
| 3.2.1 The Four Shipping Markets..... | 27 |
| 3.2.2 Cashflow from Liquid Bulk Transport..... | 28 |
| 3.2.3 Unit costs and economies of scale..... | 30 |
| 3.2.4 Summary of economics of scale..... | 31 |

| | | |
|----------|--|-----------|
| 4 | DESCRIPTION OF THE PANAMA CANAL..... | 33 |
| 4.1 | THE CANAL TODAY | 33 |
| 4.1.1 | <i>Overview.....</i> | 33 |
| 4.1.2 | <i>Ten Years of Development.....</i> | 35 |
| 4.1.3 | <i>The Present Dimensions.....</i> | 36 |
| 4.1.4 | <i>Traffic.....</i> | 37 |
| 4.1.5 | <i>Trade</i> | 38 |
| 4.1.6 | <i>Tolls.....</i> | 38 |
| 4.1.7 | <i>Competitors</i> | 40 |
| 4.1.8 | <i>Distances</i> | 42 |
| 4.2 | THE CANAL AFTER THE EXPANSION..... | 43 |
| 4.2.1 | <i>The New Dimensions.....</i> | 46 |
| 4.2.2 | <i>Traffic.....</i> | 47 |
| 4.2.3 | <i>Trade</i> | 48 |
| 4.2.4 | <i>Tolls.....</i> | 48 |
| 4.2.5 | <i>Potential Benefits of an Expansion.....</i> | 49 |
| 4.3 | SUMMARY..... | 49 |
| 5 | SCENARIO ANALYSIS..... | 51 |
| 5.1 | PREPARATION..... | 51 |
| 5.1.1 | <i>The Purpose of the Scenario Analysis.....</i> | 51 |
| 5.1.2 | <i>Time Horizon.....</i> | 51 |
| 5.1.3 | <i>History and Current Situation.....</i> | 51 |
| 5.2 | TRACKING..... | 51 |
| 5.2.1 | <i>Trend Identification.....</i> | 51 |
| 5.2.2 | <i>Stakeholder Identification</i> | 55 |
| 5.3 | ANALYSING..... | 56 |
| 5.3.1 | <i>Cross Impact Analysis.....</i> | 56 |
| 5.3.2 | <i>Timeline Scenario.....</i> | 57 |
| 5.3.3 | <i>Critical Uncertainties.....</i> | 58 |
| 5.4 | SUMMARY..... | 61 |
| 6 | CONCLUSIONS..... | 63 |
| 6.1 | DESCRIBING THE CANAL | 63 |
| 6.2 | ANALYSIS | 64 |
| 6.3 | OPPORTUNITIES AND RISKS..... | 64 |
| 7 | REFLECTIONS..... | 67 |
| 7.1 | THE PANAMA CANAL EXPANSION | 67 |
| 7.2 | RECOMMENDATION | 67 |
| 7.3 | THE CONDUCTING OF A SCENARIO ANALYSIS | 68 |
| | REFERENCES..... | 69 |
| | LITERATURE..... | 69 |
| | INTERNET | 70 |
| | INTERVIEWS | 72 |
| | APPENDIX..... | 73 |

TABLE OF FIGURES

| | |
|--|----|
| Figure 2.1 – Traditional planning compared to scenario planning..... | 10 |
| Figure 3.1 – Differences between scenarios, prognosis and visions | 20 |
| Figure 3.2 – Different scenario projects. | 22 |
| Figure 3.3 – Cross impact analysis form..... | 25 |
| Figure 3.4 – Cross impact analysis diagram..... | 26 |
| Figure 3.5 – Scenario Cross based on two uncertainties..... | 27 |
| Figure 3.6 – Shipping cashflow model..... | 29 |
| Figure 4.1 – Panama Canal overview | 34 |
| Figure 4.2 – Map and cross section of the Panama Canal. | 34 |
| Figure 4.3 – Jimmy Carter and Torrijos Herrera in 1977..... | 35 |
| Figure 4.4 - Differences in business models before and after 2000. | 36 |
| Figure 4.5 – History of toll increases. | 39 |
| Figure 4.6 – The Northwest Passage..... | 42 |
| Figure 4.7 – Distances in nautical miles with and without the Panama Canal. | 43 |
| Figure 4.8 – Components of Third Set of Locks Project..... | 45 |
| Figure 4.9 – The third set of locks..... | 46 |
| Figure 4.10 – Comparison between Panamax and post-Panamax..... | 47 |
| Figure 4.11 – Vessel beam and draft dimensions in meters..... | 48 |
| Figure 4.12 – Comparison in meters between the existing and the new locks. | 50 |
| Figure 5.1 – Global GDP growth in %..... | 52 |
| Figure 5.2 – CIM-analysis of the trends on the tanker freight market..... | 56 |
| Figure 5.3 – Cross impact diagram..... | 57 |
| Figure 5.4 – Scenario cross predicting four different scenarios. | 59 |

1 INTRODUCTION

The first chapter presents the background and problem definition. The purpose of the report is described to give the reader a more solid frame to the thesis. Furthermore, the target group and delimitations, the disposition of the thesis and a list of terms and abbreviations are presented.

1.1 Background and Problem Definition

In 1936 a twenty year old man, by the name Sten Allan Olsson, established himself within the metal and scrap business with help of a loan of SEK 25,000. After the Second World War he could finally buy his own ship from the earnings, and due to the war there was a pent-up need for tonnage, which made the fleet grow rapidly in the years to come.¹

In 1978, when the revenue had passed a billion SEK, it was time to diversify the business. There were investments in both properties and line ferries. In the year 1980 the company owned 21 ships and had ordered additional ten. The company was divided in different businesses which were called Stena Offshore, Stena RoRo, Stena Finans, Stena Fastigheter and Stena Marine Management. Two years later Stena Bulk was founded and became a part of the Stena Sphere.²

1983 was the year when the 37 year old Dan Sten Olsson, the founder Sten A Olsson's oldest son, took over the Stena companies. Stena Bulk was run by Ulf G Ryder alone the first year and the business concept was asset play, i.e. buy vessels cheap and sell them when the price had gone up. In 1984 the management wanted to introduce the newly bought tankers fleet on the Stockholm Exchange and the shipping company Concordia Maritime AB was founded to do so. Concordia, in which the Stena Sphere holds a majority of the capital and almost two thirds of the votes, owns vessels and strives to buy and sell tonnage at the right time. Stena Bulk also owns ships, has a management function and additionally charters a lot of tonnage both in the long and short term as well as in the spot market. Stena Bulk also handles all the affreightment, marketing and trading with Concordia's vessels.³

¹ Hermansson, R. (2007), *Historien om Stena Bulk*, p. 11-19

² Ibid.

³ Ibid.

Today Stena Bulk's fleet consists of 72 vessels of different types and sizes. The fleet can be divided in two groups; the MAX vessels and other tankers, such as Panamax, Aframax, Suezmax and VLCC. The MAX vessels are in-house designed and developed wide-body tankers, which can carry around 30 % more cargo than traditional ships with the same draft. The company has offices in Gothenburg, Houston, New York, London, Rio de Janeiro, Helsinki, Singapore and Beijing. The vessels operate all over the world and the annual turnover is around SEK 3 billion.⁴

A crucial success factor for a shipping company like Stena Bulk is the ability to do methodical analysis of the business environment and create a profitable strategy based on that analysis.⁵ A successful strategy also includes external factors⁶ and one important external factor in the shipping industry is the Panama Canal, which offers significant distance reduction on important trade routes.^{7, 8} Big changes have been planned and just in time for the Panama Canal centennial in 2014 the expansion of the Canal, or *the third set of locks project* as it also is called, is estimated to be completed. The operations of the new locks will start in 2015.⁹

The Panama Canal expansion referendum was held on October 22, 2006, when the citizens of Panama approved the project by a wide margin. On September 3, 2007 the expansion project officially started. The enlargement will give bigger ships than the Panamax, which are the vessels that are built to just be able to fit in the Panama Canal locks today, the opportunity to use this important passage.¹⁰

The new locks could generate great opportunities for the shipping industry since larger vessels will be able to pass through the Canal, but at the same time the tolls, which should pay for the project and generate profits to the Panama state, might soar. Shipping companies are often striving to increase their vessels carrying capacity as much as circumstances permit, because of the economics of scale, something that might be reflected when the new locks become available.¹¹

⁴ Stena Bulk, *About Stena Bulk*, <http://www.stenabulk.com> 2009-06-22

⁵ Stena Bulk, *Business Concept*, <http://www.stenabulk.com/en/TheCompany/Business-Concept/> 2009-07-03

⁶ Roos, G. (2002), *Strategi*, p. 57

⁷ Mikael Laurin, *Laurin Maritime*, 2009-09-25

⁸ Robert Uggla, *Broström*, 2009-09-22

⁹ ACP (2006), *Proposal for the Expansion of the Panama Canal*, p. 6

¹⁰ BBC News (2006), *Panamanians back canal expansion*, <http://news.bbc.co.uk/2/hi/americas/6074106.stm> 2009-06-23

¹¹ Stopford, M. (2009), *Maritime Economics*, p. 436

The Panama Canal expansion is an external factor that is made to change cargo volumes, channel fee income, the average transit time and it might also change or create new profitable transportation routes. The shipowners that operate in the region will, in one way or another, be affected by this. For tanker shipping companies like Stena Bulk the challenge is to create robustness for the future development in the tanker freight market, i.e. become aware of and understand opportunities and risks created by the expansion.¹²

1.1.1 Purpose

The purpose of this thesis is to describe and analyse the expansion of the Panama Canal in order to create increased robustness for the future development in the tanker freight market.

1.1.2 Target Group and Delimitations

This report is directed to two target groups, senior students with a business and engineering background as well as stakeholders in Stena Bulk.

The thesis will be limited to a work effort of 20 weeks and it will be restricted to a description and analysis of the expansion of the Panama Canal, as a base to generate future scenarios on the tanker freight market.

No environmental consideration will be given nor will any strategies be created, implemented or evaluated.

1.1.3 Disposition of the Thesis

Chapter 1 – Introduction

The first chapter presents the background and problem definition. The purpose of the report is described to give the reader a more solid frame to the thesis. Furthermore, the target group and delimitations, the disposition of the thesis and a list of terms and abbreviations are presented.

Chapter 2 – Method

The purpose of this chapter is to clarify how the study was conducted. It describes the research methods used to achieve the aim of the thesis. The methodological strategy is presented and the collection of data and credibility of the thesis is discussed.

Chapter 3 – Theory

The theory chapter is divided into two main parts. The first part presents theories and models used when conducting a scenario analysis. The second

¹² Ulf Bäcklund & Markus Linbom, *Stena Bulk*, 2009-09-14

part focuses on maritime economics and is important in order to give a deeper understanding of the logic that characterises the business environment of tanker shipping.

Chapter 4 – Description of the Panama Canal

This chapter is divided into two parts, where the first part gives an important insight into the context in which the Panama Canal functions today. The second part concentrates on how the expansion program will affect the Canal.

Chapter 5 – Scenario Analysis

In this chapter the findings are analysed using the two first steps of the working model TAIDA™, which was presented in chapter three. The results from these steps are used to form scenarios of the Panama Canal expansion.

Chapter 6 – Conclusions

In this chapter the conclusions that summarises the scenario analysis is presented, in reference to the purpose stated in chapter one. Risks and opportunities from the scenarios of the Panama Canal expansion are described.

Chapter 7 – Reflections

In this chapter additional personal reflections regarding the Panama Canal expansion are presented. Also recommendations of how to take advantage of the expansion are presented to guide the management at Stena Bulk to form a successful strategy.

References

Here the reader will find all the sources of information used whilst conducting the surveys and finalising the thesis. The primary sources consist of interviews of participants on the tanker freight market. The secondary sources are the written sources used to gather information on theories, models and the tanker shipping industry in general. They are divided into two main parts; literature and internet.

Appendix

In the appendix the interview guide is presented in both English and Swedish along with charts and a quick answers guide.

1.2 Abbreviations and terms

| <i>Abbreviation</i> | <i>Full form/ explanation</i> |
|---------------------|--|
| Aframax | Tanker of 80,000-120,000 dwt. |
| ACP | Autoridad del Canal de Panamá (Panama Canal Authority). |
| Charterer | Person or company who hires a ship from a shipowner for a period of time (time charter) or who reserves the entire cargo space for a single voyage (voyage charter). |
| Dwt | Deadweight tonnage. |
| GDP | Gross Domestic Product. |
| IMF | International Monetary Fund. |
| IMO | International Maritime Organization. |
| LNG | Liquefied Natural Gas. |
| LOA | Length OverAll. |
| LPG | Liquefied Petroleum Gas. |
| MLW | Mean Low Water. |
| OPEC | Organization of Petroleum Exporting Countries. |
| Panamax | The largest acceptable size in order to transit the Panama Canal. ¹³ |
| Panamax plus | Panamax vessels with over 12 m maximum drafts in TFW. ¹⁴ |
| PCA | Panama Canal Authority. |

¹³ Lloyd's Register (2004), *Modern ship size definitions*, p. 1

¹⁴ ACP (2006), *Proposal for the Expansion of the Panama Canal*, p. 33

| | |
|--------------|---|
| Post-Panamax | Vessels larger than Panamax vessels. They do not fit in the existing locks. |
| PC/UMS | Panama Canal Universal Measurement System. The PC/UMS ton is the unit used at the Canal to establish tolls, and measures vessels volumetric cargo capacity. ¹⁵ |
| PLD | Precise Level Datum. The geodesic reference level utilised in the Canal. |
| Shipbroker | Individual with current market knowledge who functions as intermediary between buyers and sellers in return for a percentage commission on the transaction. |
| Suezmax | Tanker able to transit Suez Canal fully loaded, 120,000-200,000 dwt. |
| Tanker | Ship design for the carriage of liquid in bulk with cargo space consisting of several tanks. Tankers carry a wide variety of products, including crude oil, refined products, liquid gas and wine. |
| TEU | Twenty-foot Equivalent Unit. |
| TFW | Tropical Fresh Water. Fresh water is less dense than sea water, therefore vessels displace more in fresh water than in sea water. For example a Panamax container vessel 294 x 32.2 m displaces approx. 0.3 m more in TFW than in salt water. ¹⁶ |
| VLCC | Very Large Crude Carrier, tankers over 200,000 dwt. |
| WS | Worldscale is a unified system of establishing payment of freight rate for a given oil tanker's cargo. |

¹⁵ ACP (2006), *Proposal for the Expansion of the Panama Canal*, p. 12

¹⁶ *Ibid.*, p. 5

2 METHOD

The purpose of this chapter is to clarify how the study was conducted. It describes the research methods used to achieve the purpose of the thesis. The methodological strategy is presented and the collection of data and credibility of the thesis is discussed.

2.1 Methodology

The methodology is the fundamental work approach chosen for the thesis. A framework and principles are being stated in order to help the process to go from an overall objective and with appropriate steps, land in an increased knowledge about the issue. Depending on the objectives and nature of the study different types of methodology can be chosen. The purpose of a study varies with the task and can be divided into the following areas:¹⁷

- *Descriptive* studies with a purpose to examine and describe how something works or how it is carried out.
- *Investigating* studies with the purpose to get in-depth understanding of how something works or how it is carried out.
- *Explanatory* studies with the purpose to search for reasons and explanations for how something works or is carried out.
- *Problem-solving* studies with a purpose to find a solution to an identified problem.

A study can be divided into several part-studies, for example a problem could be identified in a descriptive or investigating part-study and then solved in a problem-solving part-study.¹⁸

The methodology can be fix or flexible. If a study in most parts is defined before the work has started the methodology is fixed. If the methodology is flexible the study can be adapted and modified to changing conditions when needed.¹⁹

¹⁷ Höst, Regnell & Runeson (2006), *Att genomföra examensarbete*, p. 29

¹⁸ Ibid.

¹⁹ Ibid., p. 31

2.1.1 Choice of Orientation

This thesis is based on studies with both descriptive and explanatory nature. In order to fulfil the first part of the thesis purpose of describing the Panama Canal and the ongoing expansion, a descriptive part-study has been chosen. The scenario analysis is of an explanatory nature since the purpose is to explain how the expansion will affect the tanker freight market. A flexible methodology has been used.

2.2 Research Methods

In order to make a concrete plan for the research work, an appropriate method or combination of methods must be chosen.²⁰

2.2.1 Qualitative or quantitative research

First, there are two main research categories to choose from; qualitative and quantitative research. These two methods are often related to the same premises and often overlap each other. The distinction between qualitative and quantitative lays in the difference between the analytic treatments of the data, not in the research method itself. Even if the distinction is not “waterproof”, it is rather a simplification, the differences between the two methods are described below:²¹

- **Qualitative research** has a tendency to use words instead of numbers as the central analysis base and is more of a describing nature. It is often linked to smaller studies and a holistic perspective with a subjective interference from the researcher. The research design is open for changes during the process.²²
- **Quantitative research** has a tendency to use numbers instead of words as the central analysis base. It is more linked to analysis and large studies. The researcher should remain neutral without subjective interference and the research should have a specific focus. The research is also associated with a predetermined design.²³

Since the study of describing the impact of the Panama Canal expansion on the tanker freight market is of a descriptive nature with a holistic perspective and is difficult to measure in mere numbers the qualitative method was chosen.

²⁰ Höst, Regnell & Runeson (2006), *Att genomföra examensarbete*, p. 30

²¹ Denscombe, M. (2009), *Forskningshandboken*, p. 319-325

²² Ibid.

²³ Ibid.

2.2.2 More About Qualitative Research

Qualitative methods are research methods or ways of finding out what people do, know, think and feel by analysing documents and interviewing people. Qualitative data, whether it is words or pictures, is a product of an interpretation process. The data is being produced while it is interpreted and used by the researcher. This means that the *interpretation* of the qualitative data plays an important part, i.e. the researcher's identity, standards and convictions are part in the production and analysis of the data.²⁴

2.2.3 Scenario Planning and Analysis

In order to conduct an appropriate analysis in line with the thesis purpose, methods that deals with future uncertainties has to be chosen.

Scenario planning is a method used to analyse and handle uncertainties in the future business environment. It is a tool for organisations to coordinate discussions about and analyse future scenarios in a medium long and long range with strategic planning in a short and medium long range.²⁵

Scenario planning consists of two phases, *scenario analysis* and *strategic planning*, and are linked together by the scenarios, which are created during the analysis phase. Another way to put it is that scenario planning is the combination of *scenario analysis* for strategic purposes and *strategic planning* based on the result of the scenario analysis. For further understanding of the meaning of scenario planning the differences between traditional strategic planning and scenario planning are presented in figure 2.1.²⁶

²⁴ Denscombe, M. (2009), *Forskningshandboken*, p. 367-369

²⁵ Lindgren, M. (2008), *Scenarioplanering*, p. 36-37

²⁶ Ibid.

| Characteristics in traditional planning compared to scenario planning | | |
|--|---|---|
| | <i>Traditional planning</i> | <i>Scenario planning</i> |
| Perspective | Biased “everything else the same” | Overall, “nothing else the same” |
| Variables | Quantitative, objective, known | Qualitative, not necessarily quantitative, subjective, known or hidden |
| Kinship | Static, stable structures | Dynamic, appearing structures |
| Declaration | History explains the future | The future is “the present’s reason to be” |
| View of the future | Simple and certain | Multifaceted and uncertain |
| Method | Deterministic and quantitative models (economical and mathematic) | Analytic intention, qualitative and stochastic methods (cross-impact and system analysis) |
| Attitude towards the future | Passive or adaptive (what happens, happens) | Active and creative (the future is created) |

Figure 2.1 – Traditional planning compared to scenario planning.²⁷

Especially when times are uncertain, there is a need for a higher level of future analysis that creates uncertainty-based futures; scenarios. By doing so an organisation may increase its response ability and robustness for future challenges.²⁸ The main purpose for scenario analysis is not to predict the future; it is to create awareness of possible futures. It is also a way to learn more about the business environment and its trends, driving forces, uncertainties, risks and possibilities in order to avoid making wrong decisions.²⁹

This report uses the first phase of the strategic planning, i.e. the scenario analysis, and its methods in order to fulfil the purpose of the study.

2.2.4 Scenario Analysis Methods

Scenario analysis is based on theories and analysis models and these are described in chapter 3.

2.2.5 Choice of Scenario Analysis Methods

In chapter 3 the TAIDATM model is described. This model is used in its whole when conducting a scenario planning project. Since this report uses the first phase of scenario planning, i.e. scenario analysis, only the two first steps in the

²⁷ Lindgren, M. (2008), *Scenarioplanering*, p. 37

²⁸ Ibid., p. 19-20

²⁹ Ibid., p. 34-36

TAIDA™ model is needed. These steps are *tracking* and *analysing*. Before starting with these steps a preparation was conducted.

Preparation

A clear purpose and a reasonable time horizon were stated. In order to start the tracking phase a clear view of the past and current situation of the business environment was created.

Tracking

First, trend identification was made in order to find important trends in the chosen business environment. After that, stakeholder identification was conducted to fully understand which forces that are acting in the tanker freight market and around the Panama Canal.

Analysing

A cross impact analysis was made to understand how the trends impact on each other and which trends that are overall driving and which that are overall dependent. An illustrative timeline was created based on the previous analyses, to summarise and to get a clearer picture of the most probable scenario. The two most critical uncertainties were identified and used in a scenario cross in order to get four different scenarios, which were all analysed and presented in a descriptive manner.

2.3 Data Collection

The collected data can be divided into primary and secondary data, where the primary data is collected or created by the researcher and the secondary by someone else. The different methods of collecting data, such as questionnaires, interviews, observations and written sources, all have their strengths and weaknesses in certain situations. Since every method has its limitations the best way is to combine multiple methods and thus increase the amount of data and improve the quality of the research. This is referred to as triangulation.³⁰

The main source of primary empirical data in this report is interviews. In addition to the interviews the written sources have been an important source of secondary data. No direct observations have been made since no work has been done in Panama or at Stena Bulk.

³⁰ Quinn Patton, M. (2002), *Qualitative Evaluation and Research Methods*, p. 247

2.3.1 Interviews

Since we cannot observe everything, such as feelings, thoughts and intentions, the researcher has to ask people questions about those things.³¹ The three most important types of interviews are called *structured*, *semi-structured* and *unstructured*.

- **Structured interviews** use a preset interview questionnaire and the researcher has a strong control over the design of the questions and answers. This gives the advantage of standardisation and the aim is that the context of the interview remains the same for every interview, i.e. the responses can then be compared in a reliable manner. Since the personality of the interviewer and the surrounding environment is not affecting the answers in a crucial way the validity is improved.
- **Semi-structured interviews** use prepared topics and questions but these are more general and open and the order these are asked may vary. The focus is on the respondent, who has the liberty to further develop and highlight certain aspects.
- **Unstructured interviews** use a set of themes or topics which the respondent then is free to develop and to complete his or hers thoughts. The wording and order of the questions are not preset and posed in a more informal way.³²

A qualitative interview begins with the assumption that the respondent's perspective is meaningful, knowable and able to be made explicit. The researcher should never supply or predetermine the way the respondent answers, which is the case in fixed-response questionnaires. The nuance of every phrase the respondent uses is important. The basic principle of qualitative interviews is to provide the respondents with a framework within which they can express their own thoughts in their own way.³³

In general the qualitative interviews are less structured than the quantitative. Focus is on the respondent who more easily can move to new topics and discuss his or hers point of view in a certain matter. The interviewer is able to get a more specific and detailed answer from the respondent since follow-up questions can be asked and interviews can be held more than once with the same person.³⁴

³¹ Quinn Patton, M. (2002), *Qualitative Evaluation and Research Methods*, p. 340-341

³² Denscombe, M. (2009), *Forskningshandboken*, p.233-235

³³ Quinn Patton, M. (2002), *Qualitative Evaluation and Research Methods*, p. 348

³⁴ Bryman, A. & Bell, E. (2005), *Företagsekonomiska forskningsmetoder*, p.361-368

In order to acquire relatively free and open interviews but at the same time somewhat structured, especially since persons from several different industries in or adjacent to the tanker shipping industry were interviewed, the semi-structured interview method were chosen. Before the interviews started an interview guide was created.

The Interview Guide

The researcher should design and use an interview guide in order to obtain that the same basic lines of inquiry are practised with each and every person. It consists of a set of questions or issues that should be explored during the interview, but the researcher is always free to probe and ask follow-up questions when needed regarding those topics.³⁵

The guide used is divided in three parts; personal background, general questions about the tanker freight market and questions about the Panama Canal expansion. The guide is found in both English and Swedish in the Appendix.

The Interviewed

In order to fully grasp the situation, the driving forces on the tanker freight market and the effects that the Panama Canal expansion will have, not only persons within Stena Bulk but also customers, competitors and suppliers to Stena Bulk alongside some independent actors were chosen for the interviews. The aim was to attain a wide range of information from different actors on the tanker freight market.

Due to large distances most of the interviews were made over telephone. In some cases the respondent were allowed to answer by e-mail. No recording were made, instead notes were taken during the interview.

The Effect of the Interviewer³⁶

By interfering as little as possible the effect of the interviewer remains small. This can be achieved by encourage the respondent to develop its own ideas using its own words. The result of the interview is in many ways dependent on the interviewer and can be improved by being aware of and to some extent compensate for the following factors.

- **The personal identity** such as sex, age and ethnic origin of the interviewer affect how much and how accurate the respondent is willing to give information. This also applies to interviews made online.

³⁵ Quinn Patton, M. (2002), *Qualitative Evaluation and Research Methods*, p. 343-344

³⁶ Denscombe, M. (2009), *Forskningshandboken*, p.244-247

The topic being discussed is also important when trying to understand the influence of the interviewer's identity. Some topics are more sensitive to discuss with certain people than others, due to preferences and prejudices from both interviewer and respondent.

- **Self presentation** is important and should be done in a way that minimises the impact on the research result. A passive, neutral presentation, conventional clothing and polite behaviour are ways to achieve this. There is also a risk if the interviewer starts to preach or provoke the respondent.
- **Personal commitment** prevents a gap between the interviewer and the respondent and makes it easier for the researcher to understand the context. Still, the method is unconventional and the researcher has to make sure that the readers of the report understands and shares the underlying logic and not expects the interviewer to be totally distanced.

The interviews were conducted as the last part of the data collection in order to be well prepared and conversant with the subject. The personal identity such as sex, age and ethnic origin of the interviewer is not believed to have had any or very little impact on the answers. Nearly all of the interviewed were of the same sex and ethnic origin as the interviewer. Self presentation has been made neutral and accurate. The personal commitment of the interviewer did in some cases lead to an extended exchange of views regarding shipping in general.

2.3.2 Written Documents

In addition to the interviews a large number of written sources have been included in the research. First of all other studies with focus on scenario analysis have been studied in order to find different ways and solutions. Then theories of scenario analysis and maritime economics were gathered to make sure that the report would get a solid theoretical framework.

Literature

Finding adequate literature is crucial when conducting a master thesis. The literatures were found through other works, recommendations from my supervisor and by searching the library. First method and scenario analysis literature was studied since it was obvious from the start that it would be an important part of the research. After that, shipping and maritime literature was studied to provide the research with adequate business theories. All of the books are well known, up to date and used as course literature on a university level. A list of all the literature is presented in the reference list.

Internet

In order to complement the literature a variety of articles were studied. These were found by searching on the internet and are written for well known and reliable newspapers or institutions. The articles are presented in the reference list.

2.3.3 Direct Observations

No direct observations have been made since I have been doing the writing in Lund and not in Panama or at the Stena Bulk office in Gothenburg.

2.4 Sources of Criticism

The measurements reliability, validity and objectivity can be used in order to measure a study's credibility. In this report scenario analysis is used which also makes it open for criticism.

2.4.1 Reliability

If a researcher follows the same approach and methods as another researcher has already stated and implemented, and the result and conclusions are the same, then the work is reliable. For example, if it is a case study it is not the result that should be the same by doing another case, instead it is the same case that should be done one more time with the same conclusions. Therefore it is of most importance that the researcher documents the method of the research. In qualitative research the researcher is an integrated part of the work and that makes it even more difficult to replicate.³⁷

It is important to understand that my personality and way of behaviour has influenced the findings during the interviews. Even if the same persons would be interviewed with the same questions it is not certain that the answers would be exactly the same or interpreted in the same way; the data is somewhat unique.

The thesis has been given a clear purpose and a method chapter that gives a deeper insight of which and why different choices were made. This was done to improve the reliability of the work.

³⁷ Yin, R.K. (2006), *Fallstudier: design och genomförande*, p. 59

2.4.2 Validity

Validation is the question to what extent the researcher's results are consistent with reality. It is a measure of how well the researcher finds the adequate things to study.³⁸

Since the qualitative research sees the reality as holistic, multidimensional and in a state of constant change there is no fixed and objective phenomenon waiting on being discovered, observed and measured. Instead it is people's construction of the reality and how they experience it that is being studied. The validity of a work is appraised by the researcher's ability to reproduce these constructions.³⁹

Strategies to improve the validity are triangulation, feedback from respondents, observation during a long time, feedback from colleagues, participative approach and clarification of distortions.⁴⁰

To improve the validity, attention has been paid to some particular issues. My personal influence on the findings has previously been discussed in this chapter in order to clarify that part. During interviews I was able to recheck and control data whilst gathering it. The data is mostly primary data from interviews and secondary data from written sources. I have been striving to achieve triangulation by interviewing persons from a wide range of different perspectives and by matching it to the written findings.

2.4.3 Objectivity

Objectivity concerns the extent to which values influence the study. The study's objectivity increases by clarifying and justifying the choices made in the study, since the reader then is given the opportunity to consider the results presented.⁴¹

2.4.4 Criticism of Scenario Analysis

Although scenario analysis has been used for a long time and by several companies,⁴² its subjective and heuristic nature leaves some academic questions: How do we know if we have the right scenarios? Did we identify the right trends? Is the analysing of the trends correct?

³⁸ Merriam, Sheran B. (1994), *Fallstudien som forskningsmetod*, p. 174-180

³⁹ Ibid.

⁴⁰ Ibid.

⁴¹ Björklund & Paulsson (2003), *Seminarieboken*, p. 61

⁴² Lindgren, M. (2008), *Scenarioplanering*, p. 12

Whether scenarios are conventional or extreme in their story lines, few are likely to become reality in all their aspects. Their usefulness lies not in their accuracy but in their ability to encourage users of the scenarios to think in a multidimensional way and help them to be aware of opportunities and risks. The processes of both developing and using the scenarios also offer opportunities to develop new knowledge about the business environment and its future.⁴³

So the questions and concerns are legitimate and the answer is that scenario analysis should not be used as a way to find an absolute truth. It is a way to increase the response capabilities and the robustness for a future in constant change.⁴⁴

⁴³ Lindgren, M. (2008), *Scenarioplanering*, p. 34-35

⁴⁴ *Ibid.*, p. 16-17

3 THEORY

The theory chapter is divided into two main parts. The first part presents theories and models used when conducting a scenario analysis. The second part focuses on maritime economics and is important in order to give a deeper understanding of the logic that characterises the business environment of tanker shipping.

3.1 Scenario analysis

According to Lindgren and Bandhold (2008) scenario analysis is especially valuable when it comes to paradigm shifts or radical changes in the surroundings. Traditional linear analysis doesn't work under this circumstances; it is rather inappropriate.⁴⁵

3.1.1 What is a scenario?

There is no distinct definition of what a scenario is; different authors have their own description. According to Michael Porter (1985) it is an inner coherent view of what the future will look like. Peter Schwartz (1991) describes it as a tool to arrange ones opinions about different future surroundings and environments so that the own decisions can be made in the right way. Gil Ringland (1998) means that it is the point in the strategic planning that regards the tools and techniques for handling the uncertainties of the future.⁴⁶

These definitions show that a scenario is not the same as a prognosis, i.e. a projection of the present that does not include too big surprises. Nor is a scenario the same as a vision which rather is a desired future. To sum up the differences are presented in figure 3.1.⁴⁷

⁴⁵ Lindgren, M. (2008), *Scenarioplanering*, p. 38

⁴⁶ Ibid., p. 31

⁴⁷ Ibid.

| Differences between scenarios, prognosis and visions | | |
|---|---|----------------------------|
| Scenarios | Prognosis | Visions |
| Possible, probable futures | Probable futures | Desired futures |
| Uncertainty-based | Based on certain relations | Based on values |
| Illustrated risks | Hidden risks | Hidden risks |
| Qualitative or quantitative | Quantitative | Often Quantitative |
| Must know what we decided | Must have the courage to take decisions | Energising |
| Rarely used | Used daily | Used quite frequently |
| Strong in the medium to long perspective and medium high to high grade of uncertainty | Strong in the short time perspective and low grade of uncertainty | Prods for voluntary change |

Figure 3.1 – Differences between *scenarios, prognosis and visions*⁴⁸

A scenario is a well thought through answer to the question “What might happen?” or “What if...?” The distinction lays in that both the prognosis and the vision has a tendency to hide future risk whilst the scenario gives the user the opportunity to handle them.⁴⁹

3.1.2 Why do we need scenarios?

The human brain is constantly making up scenarios for the near future; it is a normal part of our lives. Just like any organisation the human need a well functioning feedback-system to get a response from what has happened. But we also need information about the future to make correct decisions and choose the right path; we need a “feedforward-system”.⁵⁰

Even if the human brain constantly generates scenarios it is not very common that companies systematically use scenario planning. Instead most organisations uses prognosis to handle future uncertainties and minimising risks. During stable times and with a short time frame forecasts are effective. But with a longer time frame and with a more complex system to predict, the prognosis will result in a blunt and even incorrect way to plan for the future.⁵¹

⁴⁸ Lindgren, M. (2008), *Scenarioplanering*, p. 35

⁴⁹ Ibid., p. 31

⁵⁰ Ibid., p. 32

⁵¹ Ibid., p. 32-35

The benefits of using the scenario technique can be summarised as follows:⁵²

- It is a format adapted to the brain.
- It creates opportunities to think different, to think divergent.
- It reduces the complexity and uncertainties to a manageable size.
- It is a communicative format.

3.1.3 TAIDA™

TAIDA™ is a well-proven model for scenario planning and has been used in hundreds of scenario projects during the last decade. It is short for the five steps in the model which are *Tracking, Analysing, Imaging, Deciding* and *Acting*. The two first steps, tracking and analysing, is used during the scenario analysis and the other three during the strategic planning.⁵³

- **Tracking** – this first step is used to track down and describe changes in the surroundings which can affect the current issue.
- **Analysing** – the next step is to analyse the changes and create scenarios.
- **Imaging** – after the gathering of insights and ideas of possible futures it is time to create images of what we want: visions.
- **Deciding** – this phase is about identifying development areas and strategies to meet the threats and achieve visions and goals.
- **Acting** – in this phase it is time to fulfil the plans.

3.1.4 Preparation

Before starting with the TAIDA™ steps some preparation has to be made. It is important to state a purpose and a time horizon in order to create a solid frame for the analysis. An understanding of the past and current situation is also relevant to perceive the logic and to create a map of the business environment.⁵⁴

Stating the Purpose

When conducting a scenario analysis project it is important to state a clear purpose, i.e. what is the reason for doing the project? Figure 3.2 shows different purposes with different focuses.

⁵² Lindgren, M. (2008), *Scenarioplanering*, p. 41

⁵³ Ibid., p. 50

⁵⁴ Ibid., p. 61-68

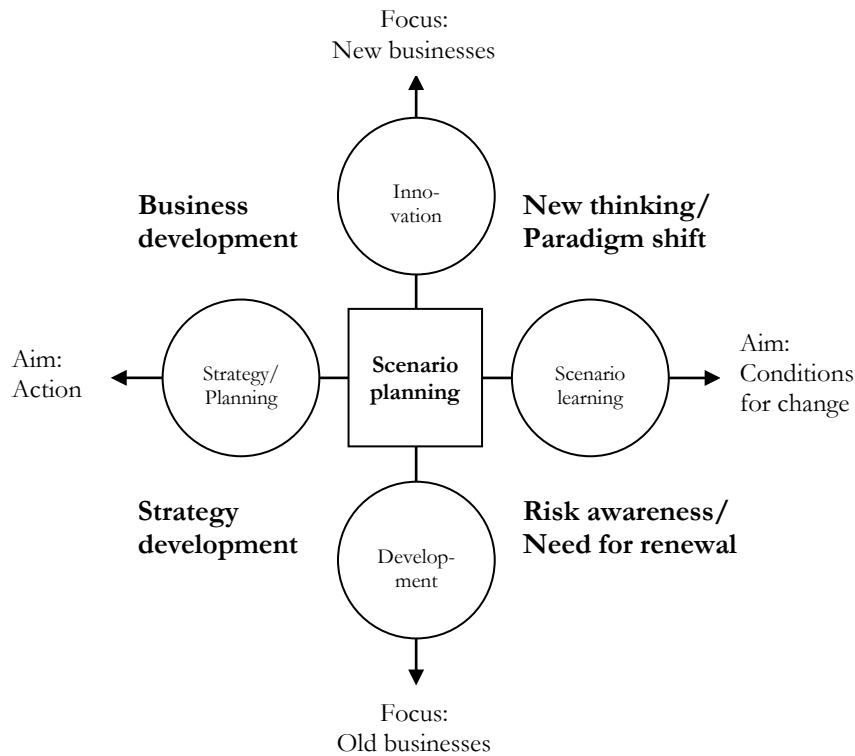


Figure 3.2 – Different scenario projects.⁵⁵

In the first quadrant the purpose is to identify and consider the changes in the surroundings that already have and will continue to occur. The focus lies on new business and is thus called the *New thinking/paradigm shift*. The second quadrant also focuses on new business but changes have already been identified so the organisation is here more action oriented than in the previous quadrant; the area is called *Business development*. The third quadrant also includes organisations that are action oriented but the focus here stays on old business, so the purpose is to prepare the organisation for the future. The third quadrant is called *Strategy development*. In the last quadrant, called *Risk awareness/need for renewal*, the organisation has its focus on old business but it is a process of identifying the need for change rather than act for change.⁵⁶

Stating the Time Horizon

The time horizon for scenarios has to be short enough to create probable scenarios; very much will change over for example 20 years, which makes it

⁵⁵ Lindgren, M. (2008), *Scenarioplanering*, p. 36

⁵⁶ Ibid., p. 61-64

very complex to predict the future. But it should also be long enough so that it is possible to imagine important changes that will affect the future business.⁵⁷

Understanding the Past and Current Situation

Even if scenario analysis is all about the future it is important to first have a clear picture of the past and the present. What is the history of the organisation and how has it evolved until today? What does the market and competition look like and how has it evolved? What circumstances have been given rise to changes? What have been the most important indications of change? Even if the future look uncertain with many opportunities and threats there are a lot of driving forces that remain constant. The logic that characterises the arena will still be there. As soon as the aim has been stated, an overall picture of the history and the present situation should be created, i.e. the underlying conditions. This “map” of the current situation should consist of both the players and the system to be analysed. It is important to clarify the underlying conditions for the scenario analysis and also for the visions and strategies, in other words to go through all the different phases in TAIDA™ that are necessary for the purpose.⁵⁸

Since the delimitations of the report prevent both the forming and implementation of strategies only the two first steps of the TAIDA™ model will be presented.

3.1.5 Tracking

After the preparation phase where a clear aim, a clear issue with a time horizon and an understanding of the past and the current situation is created, it is time to look at the future. The tracking phase is about tracing changes in the business environment that could affect the specific topic, i.e. finding trends, driving forces and uncertainties that have an impact on the future of the issue.⁵⁹

Instead of starting off by looking at the own organisation, an outside-and-in perspective is used. By doing so and by starting with the driving forces of the organisation’s arena, it is possible to predict the changes that have not already been clarified. The long term development of such an arena depends on the driving forces in the external surroundings; therefore it is important to start there and not inside the organisation. The goal is to find distinctive, external and separate trends which cover the organisation’s business environment.⁶⁰

⁵⁷ Lindgren, M. (2008), *Scenarioplanering*, p. 67

⁵⁸ Ibid., p. 64-67

⁵⁹ Ibid., p. 69-73

⁶⁰ Ibid.

Trend Identification

When dealing with the future a great difficulty is that most people talk about what they think will happen. These thoughts are rarely relevant since they consist of images of what people would like to see, daydreams or wishes, or what they fear, nightmares or threats. To avoid this it is important to start in the present and try to focus only on those things that can be observed and that already have been changing in a certain direction for some time, i.e. trends.⁶¹

A trend is a deeper change and not just a temporary fad. With a comparison to the meteorology a trend would be climate change and not weather changes.⁶²

Identifying trends in a specific business environment requires a creative and qualitative approach. Interviews with actors, statistic data and articles must be analysed in order to spot the most important trends.⁶³

Stakeholder Identification

Most things that happen in the business environment are initiated by different actors and then developed through an interaction between these actors and their interests. By identifying the stakeholders in a certain arena the forces that are able to affect the development can be understood.⁶⁴

A better understanding of the stakeholders and their aims and means on a business arena helps to explain why certain events occur. It can make the future seem less inevitable.⁶⁵

3.1.6 Analysing

The trends and driving forces found in the tracking phase should now be analysed. Patterns are often found and should be put in a time perspective. This phase is about identifying driving forces and consequences in order to understand how the already identified trends interact with each other. It is not enough to study the trends separately; it is the deeper understanding of the interaction and the impact the trends have on each other that makes it possible to paint pictures of the future.⁶⁶

Cross Impact Analysis

One way of achieving this deeper understanding is to do a cross-impact-analysis which is a way to identify relations and context. A causal loop-diagram

⁶¹ Lindgren, M. (2008), *Scenarioplanering*, p. 69-73

⁶² Ibid., p. 70

⁶³ Ibid., p. 73-74

⁶⁴ Ibid., p. 167

⁶⁵ Ibid., p. 167-168

⁶⁶ Ibid., p. 74

with the result from the analysis is then plotted to get a better overview of the result.⁶⁷

A cross impact analysis (CIM-analysis) is carried out as follows:⁶⁸

- A CIM-analysis requires a set of identified trends. The trends should preferably have a clear direction, e.g. increasing or decreasing. Each trend will be represented by a variable, e.g. a number.
- Create a form and fill it with the variables, see figure 3.3.
- To which extent does trend 1 affects trend 2? Positive, negative or not at all? Mark with a number on the scale -2 to +2. Go through the form systematically and appraise each and every block.
- Sum up the absolute values. The sum of each row indicates how driving the trend is. A driving trend affects several other trends a lot. The sum of each column indicates how dependent the trend is. A dependent trend is affected by a lot of other trends.
- Plot the result in a diagram with dependency on one axis and driving ability on the other, see figure 3.4.

| Trend | 1 | 2 | 3 | 4 | Sum: |
|-------|----|----|----|---|------|
| 1 | | -2 | -1 | 2 | 5 |
| 2 | 2 | | 0 | 0 | 2 |
| 3 | -1 | 0 | | 0 | 1 |
| 4 | -2 | 2 | 0 | | 4 |
| Sum: | 5 | 4 | 1 | 2 | |

Figure 3.3 – Cross impact analysis form.⁶⁹

⁶⁷ Lindgren, M. (2008), *Scenarioplanering*, p. 76

⁶⁸ Ibid., p. 178-179

⁶⁹ Ibid., p. 179

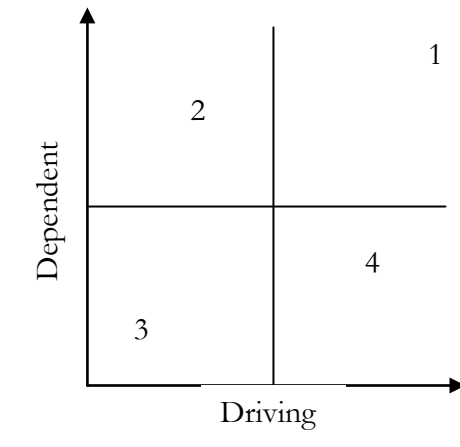


Figure 3.4 – Cross impact analysis diagram.⁷⁰

Timeline Scenario

After analysis of stakeholders, trends and their impact on each other, a timeline with a synopsis can be created. This will give the “safe” image, which means the future development that is *relatively* certain. It can be described as a summary of previous analyses.⁷¹

The trend analysis is helpful when creating a timeline that describes the development of the safer trends in words. This created scenario is easier to understand than the trends alone with their definitions or just the cross impact diagram.⁷²

Critical Uncertainties

To complement the timeline scenario the two most uncertain but still important forces are identified. Since the human brain has a tendency to wish for just one scenario, most likely the best case, it will only give a one-dimensional result. The dilemma is that the uncertain World is very complex and has a great number of aspects that have to be handled. The two identified important uncertainties can help us to be prepared for multidimensional and different scenarios.⁷³

⁷⁰ Lindgren, M. (2008), *Scenarioplanering*, p. 179

⁷¹ Ibid., p. 78

⁷² Ibid., p. 80

⁷³ Ibid., p. 80-81

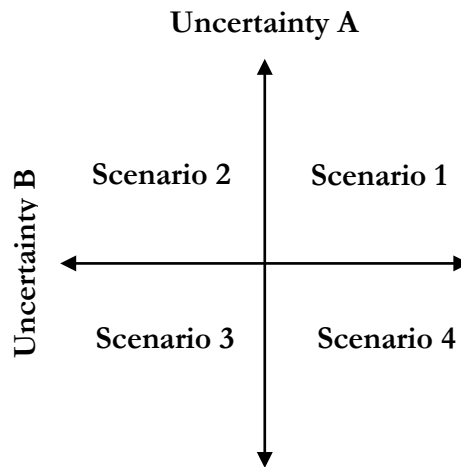


Figure 3.5 – Scenario Cross based on two uncertainties.⁷⁴

The best way to deal with uncertainties is to create a scenario-cross with the two most driving uncertainties on each axis, see figure 3.5. Four scenarios will then appear in the space between the axes and by doing so the researcher will not just get a “black or white”-picture, but a more nuanced and multidimensional one.⁷⁵

3.2 Maritime economics

Maritime economics consists of theories and models that aims to explain how the shipping market works and is organized. In order to get a deeper understanding of the business environment in the tanker freight market some of these theories must be studied.

3.2.1 The Four Shipping Markets

Sea transport services are provided by four closely related markets, each trading in a different commodity:⁷⁶

1. The freight market trades in sea transport
2. The sale and purchase market trades second-hand ships
3. The new building market trades new ships
4. The demolition market deals in ships for scrapping

⁷⁴ Lindgren, M. (2008), *Scenarioplanering*, p. 179

⁷⁵ Ibid., p. 74-90

⁷⁶ Stopford, M. (2009), *Maritime Economics*, p. 177

The Tanker Freight Market

Just as there are different sections in the financial market, such as the capital market and the insurance market, there are separate markets for different ships in the freight market. For example, tanker ships operate on the tanker freight market. Due to the fact that it takes time for ships to move around the world there are also different regional markets, accessible only to those vessels that are ready to load cargo in the area.⁷⁷

The charter rates on the freight market depend on market conditions and thus the free flow of information on the latest developments plays a vital part in the market. Recent transactions are the starting point for charter negotiations between shipowners and charterer. An example of how these transactions are reported is Lloyd's List.⁷⁸

3.2.2 Cashflow from Liquid Bulk Transport

According to Stopford (2009) there are three key variables with which shipowners have to work. These are:⁷⁹

1. The revenue received from chartering/operating the ship
2. The cost of running the ship
3. The method of financing the business

The relationship between these driving factors is shown schematically in figure 3.6.⁸⁰

⁷⁷ Stopford, M. (2009), *Maritime Economics*, p. 180

⁷⁸ *Ibid.*, p. 188

⁷⁹ *Ibid.*, p. 219

⁸⁰ *Ibid.*, p. 220

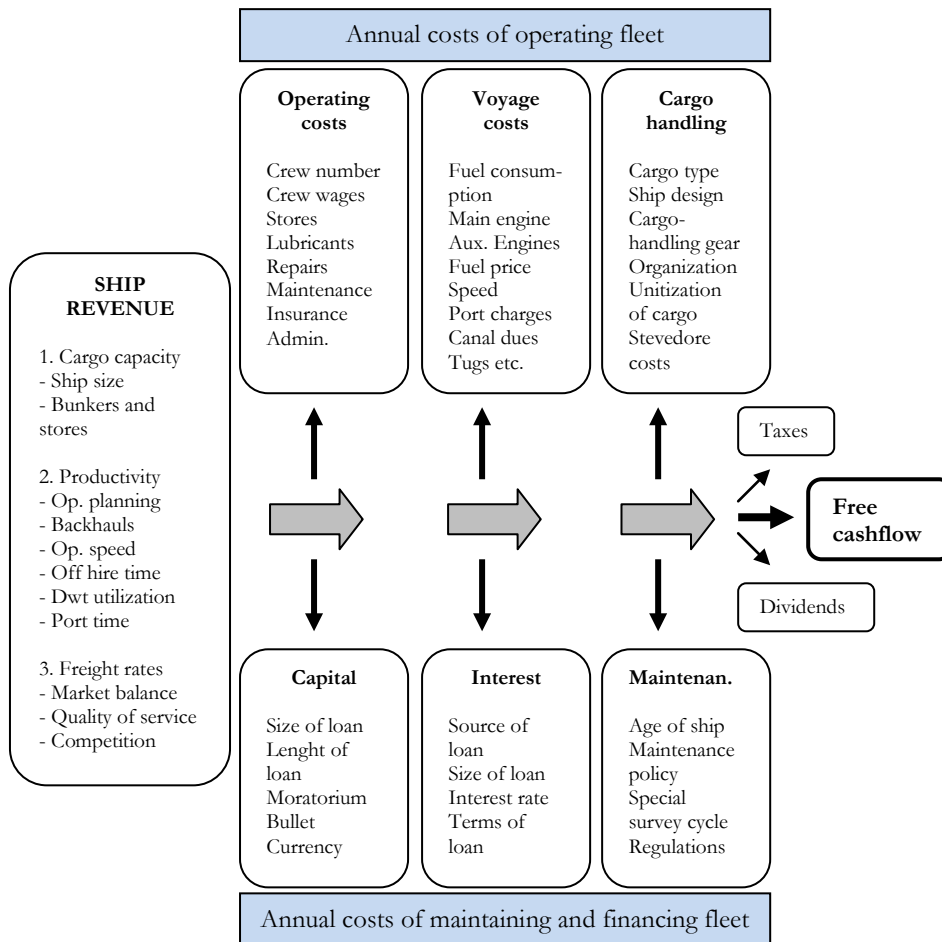


Figure 3.6 – Shipping cashflow model.⁸¹

The Classification of Revenue in the Freight Market

The different ways a shipowner can earn revenue in the freight market can be classified into three main categories. The distribution of risks and the apportionment of costs between the shipowner and charterer differ in these categories, which are:⁸²

- **Voyager charter** – this arrangement uses a freight rate that is paid per unit of cargo transported. Generally the shipowner pays all the costs, except possibly cargo handling, and is responsible for the planning and execution of the voyage as well as managing the running of the ship.

⁸¹ Stopford, M. (2009), *Maritime Economics*, p. 220

⁸² *Ibid.*, p. 242

- **Time charter** – means that the hire of the vessel is a fixed daily or monthly payment and that the owner takes the operational risk, e.g. if the ship breaks down. The charterer on the other hand pays for fuel, port charges, canal dues and other cargo-related costs. The charterer takes the market risk since he is paying the fixed hire regardless of the market conditions (unless the charter rate is linked to the market in some way).
- **Bare boat charter** – is a financial arrangement where the charter hire only covers the financing cost of the ship. The charterer takes both the operational and the shipping market risk, covering all operating, voyage and cargo-related costs.

3.2.3 Unit costs and economies of scale

An important economic relationship, in tanker shipping, is between cost and ship size, also referred to as economies of scale. Since shipping is about moving cargo the economic focus of the business is unit cost, i.e. cost per ton. The annual cost per deadweight tonne of a ship is defined as the sum of operating costs, voyage costs, cargo-handling costs and capital costs incurred in a year divided by the deadweight of the ship:⁸³

$$C_t = \frac{OC_t + PM_t + VC_t + CHC_t + K_t}{DWT_t}$$

Where C is the cost per dwt and year, OC the operating cost per year, PM the periodic maintenance per year, VC the voyage cost per year, CHC the cargo-handling cost per year, K the capital cost per year, DWT the ship deadweight and t is the year. This is an important relationship because OC, VC and K do not increase in proportion to the deadweight of the vessel, which means that using a bigger ship reduces the unit freight cost. The number of crew, for example, is the same on a 280,000 dwt VLCC as on 29,000 dwt products tanker and uses only a quarter as much fuel per deadweight tonne.⁸⁴

On the other hand bigger ships suffer the loss of flexibility. This has an impact on the revenue side of the equation by limiting the ports and canals that can be entered. A bigger size also makes it more difficult to reduce ballast time by obtaining backhaul cargoes.⁸⁵

⁸³ Stopford, M. (2009), *Maritime Economics*, p. 223

⁸⁴ Ibid., p. 223-224

⁸⁵ Ibid., p. 224

3.2.4 Summary of economics of scale

According to Stopford (2009) there are four conclusions to be made on the role of economies of scale in the tanker freight market:⁸⁶

1. There is a financial incentive to use larger vessels on a particular trade since big ships are always cheaper than small ships, other things being equal.
2. The economies of scale is much smaller on short-haul routes, in absolute terms, so there is less financial incentive to invest in the necessary infrastructure to handle bigger ships.
3. The design of short-haul vessels should focus on cargo-handling since they spend less time at sea and more in port.
4. As the voyage length reduces the delivery volume increase rapidly, so the ship size also depends on there being sufficient cargo to fully occupy bigger ships.

⁸⁶ Stopford, M. (2009), *Maritime Economics*, p. 414

4 DESCRIPTION OF THE PANAMA CANAL

This chapter is divided into two parts, where the first part gives an important insight into the context in which the Panama Canal functions today. The second part concentrates on how the expansion program will affect the Canal.

4.1 The Canal Today

4.1.1 Overview

The Panama Canal, which runs 83 kilometres (52 miles) from the Atlantic at Cristobal to the Pacific at Balboa, shortens the distance between the oceans with approximately 11,000 – 14,000 kilometres (7,000 – 9,000 miles).⁸⁷

From the Atlantic ships sail down a channel to the Gatun Locks where they are being lifted to the Gatun Lake. After the lake the ships enter Gaillard Cut and runs about 13 kilometres to Pedro Miguel where the next set of locks lowers them to a small lake. After crossing this lake the last set of locks at Mira Flores lowers them to the Pacific Ocean. See figure 4.2 for a map and cross section of the Panama Canal.⁸⁸

Except for the locks the narrowest section of the Canal is Gaillard Cut, which extends from the south edge of Gatun Lake at Gamboa to the north end of Pedro Miguel Locks. This segment, approximately 13.7 kilometres long (8.5 miles), is carved through the rock and shale of the Continental Divide.⁸⁹

⁸⁷ Stopford, M. (2009), *Maritime Economics*, p. 365

⁸⁸ Ibid.

⁸⁹ ACP, <http://www.pancanal.com/eng/general/asi-es-el-canal.html> 2009-08-04



Figure 4.1 – Panama Canal overview⁹⁰

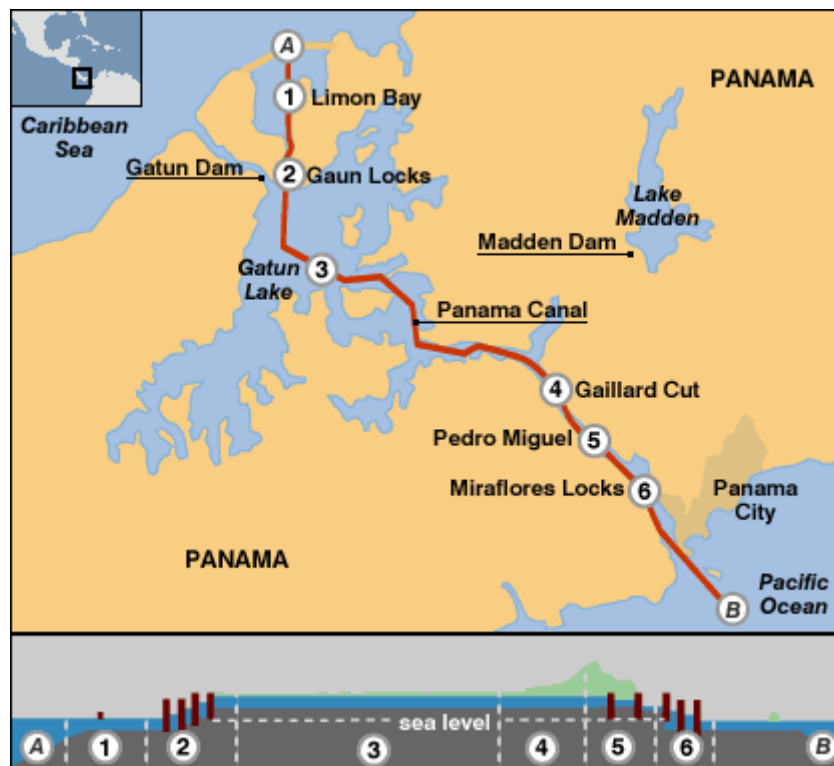


Figure 4.2 – Map and cross section of the Panama Canal.⁹¹

⁹⁰ Wikipedia, *Panamakanalen*, http://sv.wikipedia.org/wiki/Panama_Canal 2009-08-04

⁹¹ BBC News, <http://news.bbc.co.uk/2/hi/americas/5182472.stm#map> 2009-09-01

4.1.2 Ten Years of Development

On New Year's Day 2000 Panama finally assumed responsibility for operating the canal, all in accordance to the agreement signed in 1977 by the U.S. President Jimmy Carter and Torrijos Herrera Chief of Government of the Republic of Panama.⁹²

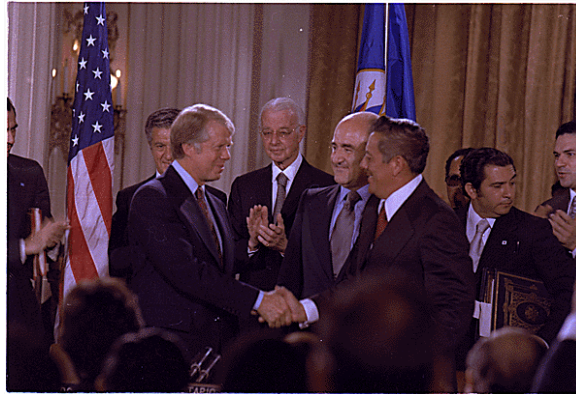


Figure 4.3 – Jimmy Carter and Torrijos Herrera in 1977.⁹³

While the American managers adopted a one-size-fits-all approach to canal traffic, seeking only to cover the costs of operating the trade route, the Panamanians established a market oriented model focused on customer attention, reliability and profitability. They embraced innovations such as charging different tolls based on the size and type of vessel as well as the weight of the freight.^{94, 95}

A transit booking system was created, allowing transit slots to be reserved in order to minimize costly idling by the canal's entrance. Today a one way transit takes about nine hours for a medium size vessel.⁹⁶

In 2007 the Panama Canal Authority began to auction off one transit each day, so that ships in a hurry could pay extra for the right to jump the queue. The

⁹² Jimmy Carter Library, *The Daily Diary Of President Jimmy Carter*, <http://jimmycarterlibrary.org/documents/diary/1977/d090777t.pdf> 2009-08-27

⁹³ Wikipedia, *Picture from Torrijos-Carter Treaties*, http://en.wikipedia.org/wiki/Torrijos-Carter_Treaties 2009-08-27

⁹⁴ ACP, *Maritime Operations*, <http://www.pancanal.com/eng/maritime/tolls.html> 2009-08-27

⁹⁵ ACP, *Tolls Table*, <http://www.pancanal.com/eng/maritime/tolls-table.pdf> 2009-08-27

⁹⁶ Stopford, M. (2009), *Maritime Economics*, p. 365

record of such an auction was made in April 2008 when an especially impatient tanker paid 397,300 U.S. dollars for that service.⁹⁷

The differences in the Canals business model before and after the Panamanians took over the control in the year 2000 is summarized in figure 4.4.



| |  |  |
|----------------------------|---|---|
| Objective | Cost recovery | Profitable and reliable business |
| Structure | Budget oriented | Performance based |
| Administration | Main user | Owner |
| Strategic objective | Economic and military | Economic |
| Price | Same for all users | By market segments |

Figure 4.4 - Differences in business models before and after 2000.⁹⁸

4.1.3 The Present Dimensions

The Canal uses a system of locks, i.e. compartments with entrance and exit gates. The locks function as water lifts: they raise ships from sea level (the Pacific or the Atlantic) to the level of Gatun Lake (26 meters above sea level); ships then sail the channel through the Continental Divide.⁹⁹

Locks

There are two existing sets of locks which are situated side by side. The locks chambers are 305 meters (1,000 feet) long, 33.5 meters (110 feet) wide and on average 12.6 meters deep (41.5 feet).¹⁰⁰

⁹⁷ USA Today, *For Panama Canal, a new era of trade is coming*, http://www.usatoday.com/money/world/2009-08-05-enlarged-panama-canal_N.htm 2009-08-27

⁹⁸ ACP (2008), *The Panama Canal Expansion Program: An Innovative Approach to Infrastructure and Expansion of a Green Route* <http://www.fasterfreightcleanerair.com/pdfs/Presentations/FFCAEC2008/Alberto%20Zubieta.pdf> 2009-09-01

⁹⁹ Stopford, M. (2009) *Maritime Economics*, p. 365

¹⁰⁰ ACP, *This is the Canal*, <http://www.pancanal.com/eng/general/asi-es-el-canal.html> 2009-08-27

Vessels¹⁰¹

The maximum **length** overall including bulbous bow for commercial or non-commercial vessels acceptable for regular transit is 289.6 m (950 feet), except passenger and container ships which may be 294.13 m (965 feet) in overall length. Vessels transiting the Canal for the first time at an overall length exceeding 274.32 m (900 feet), whether newly-constructed or newly-modified are subject to the requirement of inspection and prior review and approval of vessel plans.

The maximum **beam** allowed for vessels, measured at the outer surface of the shell plate, is 32.31 m (106 feet).

The maximum permissible **draft** for Canal transits has been set at 12.04 m (39 feet 6 inches) Tropical Fresh Water (TFW) at a Gatun Lake level of 24.84 m (81 feet 6 inches) or higher. Gatun Lake density is 0.9954 g/cm³ at 29.4°C (85°F). This provides a safe navigational margin of at least 1.52 m (5 feet) over critical elevations in the Canal, and a clearance over the south sill of Pedro Miguel Locks of 0.50 m (1 foot 8 inches) at a Miraflores Lake Level of 16.61 m (54 feet 6 inches).

The allowable **height** for any vessel transiting the Canal or entering the Port of Balboa at any state of the tide is 57.91 m (190 feet) measured from the waterline to its highest point. With prior permission from the Transit Operations Division executive manager, height may be permitted to 62.5 m (205 feet) on a case-by-case basis with passage at low water (MLWS) at Balboa. Maximum Height Restrictions are due to the tide and the unpredictable upward movement of water from swells, surges, waves, and maintenance equipment suspended beneath the bridge at Balboa.

4.1.4 Traffic

The traffic through the canal is foremost container vessels from Asia to the east coast of the U.S and Canada. In 2008 the total number of container vessel transits was over 4,000. There were also around 2,500 of dry bulk carriers and just as many of refrigerated cargo vessels transiting the canal. The number of transiting tankers was in 2008 almost 2,000.¹⁰²

Although the number of tankers account for the fourth largest group of vessels transiting the Canal, it is the third largest group when it comes to revenue to

¹⁰¹ ACP, *Vessel Requirements*, <http://www.pancanal.com/eng/maritime/notices/2009/n01-2009.pdf> 2009-08-27

¹⁰² ACP (2009), *Transit Statistics*, <http://www.pancanal.com/eng/maritime/statisti.html> 2009-08-26

the Canal. The container ships dominate the importance for the Canal and give it revenue in form of tolls of around 750 million U.S dollars yearly. Bulk carriers, tankers and vehicle carriers give the canal a yearly income of over 100 million U.S dollars each.¹⁰³

The maximum capacity of the Canal is determined by the capacity of the existing two sets of locks. The maximum capacity of the present Canal, approximately 340 million PC/UMS per year, will be reached between the years 2009 and 2012.¹⁰⁴ PC/UMS stands for Panama Canal Universal Measurement System. The PC/UMS ton is the unit used at the Canal to establish tolls, and measures vessels volumetric cargo capacity.¹⁰⁵

4.1.5 Trade

The Panama Canal traffic along principal trade routes is dominated by the Asia to U.S. East Coast trade. In the fiscal year of 2008 over 130 million PC/UMS net tons belonged to this trade route compared to the 26 and 22 million tons that came from trade routes of the South American West Coast to U.S East Coast and Europe respectively. Two other important trade routes are the U.S. and South American intercostals that each transports around 13 million PC/UMS net tons through the canal.¹⁰⁶

Main tankers trade routes include:¹⁰⁷

- Caribbean to U.S. West Coast and West Coast of South America
- U.S. East Coast/Canada to U.S. West Coast/Canada/Alaska
- U.S. East Coast and Caribbean to West Coast of Central America

4.1.6 Tolls

Tolls have been paid by ships for the use of the Canal since its opening in 1914. Implemented to cover costs, tolls were based on a flat rate for all ships and were kept low to encourage usage of the Canal. Tolls were increased for the first time in 1974 and then at regular intervals, see figure 4.5, to reflect the increasing cost of operations and improvements.¹⁰⁸

¹⁰³ ACP (2009), *Transit Statistics*, <http://www.pancanal.com/eng/maritime/statisti.html>
2009-08-26

¹⁰⁴ ACP (2006), *Third Set of Locks Project – Fact sheet*, p. 5

¹⁰⁵ ACP (2006), *Proposal for the Expansion of the Panama Canal*, p. 12

¹⁰⁶ ACP (2009), *Transit Statistics*, <http://www.pancanal.com/eng/maritime/statisti.html>
2009-08-26

¹⁰⁷ Jorge J. Corredoira, GAC, 2009-09-23

¹⁰⁸ ACP (2009), *Tolls Assesment*, <http://www.pancanal.com/eng/maritime/tolls.html>
2009-08-26

| Year | Increase |
|------|----------|
| 1974 | 19.7 % |
| 1976 | 19.5 % |
| 1979 | 29.3 % |
| 1983 | 9.8 % |
| 1989 | 9.8 % |
| 1992 | 9.9 % |
| 1997 | 8.2 % |
| 1998 | 7.5 % |
| 2002 | 8.0 % |
| 2003 | 4.5 % |

Figure 4.5 – History of toll increases.¹⁰⁹

The purpose of the tolls is set by the Canal Authority and stated as follow:¹¹⁰

“Panama Canal Tolls revenues are spent on capital investments and used to finance Canal improvement programs to allow the ACP to continue providing a safe, reliable and efficient transit service to all its customers.”

Beginning October 1994, the Canal tolls were assessed on the Panama Canal Universal Measurement System (PC/UMS), the international standard for tonnage measurement, as stated by the 1969 International Convention on Tonnage Measurement of Ships. The laden rate is applied to ships carrying cargo or passengers, while the ballast rate is applied to ships which are not carrying passengers or cargo. Other floating craft are charged on the basis of their actual displacement tonnage.¹¹¹

In October 2002, a new toll structure based on ship size and type was implemented to ensure that each vessel was charged based on the specific services it requires. The price structure was changed from a one-size-fits-all to seven separate categories for container, passenger, general cargo, dry bulk, liquid bulk, reefer and car carrier vessels. In addition, there is a discount structure with a higher rate for the first 10,000 PC/UMS tones, another rate

¹⁰⁹ ACP (2009), *Canal FAQ*, <http://www.pancanal.com/eng/noticiero/canal-faqs/index.html> 2009-08-26

¹¹⁰ Ibid.

¹¹¹ ACP (2009), *Panama Canal Tolls*, <http://www.pancanal.com/eng/general/peajes-en-el-canal.html> 2009-08-24

for the following 10,000 PC/UMS with the lowest rate for the remaining tonnage. Based on the new tolls pricing structure, when larger ships used the Canal, the average toll increase actually became lower.¹¹²

On May 1, 2005, the PC/UMS system was replaced with the TEU (twenty-foot equivalent unit) as the new measurement unit for container vessels. For other vessel types with on-deck container carrying capacity, the ACP continues to apply the PC/UMS tonnage to measure the enclosed spaces and spaces below deck, and charge a per TEU fee to the actual number of containers carried on-deck.¹¹³

In 2007, the price differentiation continued with the vessels which tolls are based upon their displacement. From now on the Canal assesses tolls based on the maximum displacement instead of the arrival displacement.¹¹⁴

4.1.7 Competitors

The competition to the Canal is alternative routes which give options for the transport of cargo between the same geographical points of origin and destination. The main trade route that uses the Canal is the Northeast Asia to U.S. East Coast route; therefore the two main competitors of the Panama Canal are the U.S. intermodal system and the Suez Canal.¹¹⁵

U.S. Intermodal system¹¹⁶

One of the main competitors to the Panama Canal is the U.S. intermodal system which offers the client a land extension of a shorter transpacific route. The transpacific maritime route consists of containership services between Asia and U.S. West Coast and regularly utilizes post-Panamax vessels. The ports on the U.S. West Coast are mainly Los Angeles, Long Beach and Seattle and from there railroad and the transcontinental road system are used to access the main consumer centres in the U.S. East Coast. The intermodal system comprises several different components and a large number of market participants such as ports, trucks, transshipment areas, railroad companies and so on. It offers shorter transport times, compared to the Panama Canal, but also higher costs and more variability in service dependability, due to the many operators.

¹¹² ACP (2009), *Panama Canal Tolls*, <http://www.pancanal.com/eng/general/peajes-en-el-canal.html> 2009-08-24

¹¹³ Ibid.

¹¹⁴ Ibid.

¹¹⁵ ACP (2006), *Proposal for the Expansion of the Panama Canal*, p. 19

¹¹⁶ Ibid., p. 19-21

The intermodal system has a 61 % market share of the Northeast Asia to U.S. East Coast trade route, compared to the Panama Canal that has a 38 % market share. The transpacific route allows the possibility to make the most of the economies of scale offered by the use of post-Panamax vessels. This decreases the number of ships on a weekly service rotation and maximizes the client's return on investment. However, the last decade's growth in the Asia-originated trade has overwhelmed the intermodal system's capacity which, together with labour conflicts, has affected the route's reliability. Substantial long-term investments are needed to solve these problems, which together with environmental taxes and regulations, suggests that the intermodal system's prices will continue to rise.

The Suez Canal¹¹⁷

In the important Asia – U.S. East Coast route the Canal also competes with the Suez Canal. It is mainly cargo from the South and Southeast Asia, i.e. Indonesia, Malaysia, India etcetera, since the Suez Canal can offer shorter sailing times than the Panama Canal from these destinations. But due to the problem in the intermodal system mentioned above and since the Panama Canal today isn't capable of handling the growing demand; some clients tend to choose the Suez Canal even when the navigational times are longer.

To maintain a weekly containership service between Asia and the U.S. East Coast through the Suez Canal, 11 vessels are required, depending on the number of port calls. The same service through the Panama Canal requires 8 vessels. This means that the Panama Canal has an advantage in terms of vessel productivity, as long as the vessel capacities are the same. The Panama Canal offers a 23 % savings in total transportation cost per container for Panamax vessels, compared to the Suez Canal. But since the Suez Canal offers post-Panamax vessels that number is reduced to 14 %. As long as both the intermodal system and the Panama Canal struggles with congestions and capacity problems, the cargo neither of them can serve will continue to be picked up by the Suez Canal.

The Northwest Passage

The concern for an opening of a competing route through the Arctic Northwest Passage made the ACP hire a team of scientists from the U.S. Arctic Research Commission in order to present analyses and conclusions in the matter. In January 2005 this group concluded that during the 21st century the central Arctic and nearby seas will continue to have a significant ice cover but that it is probable that after the year of 2050 the Passage could be ice free during the three summer months. This means that the other ships than

¹¹⁷ ACP (2006), *Proposal for the Expansion of the Panama Canal*, p. 21-22

icebreakers could be able to transit the passage during this short period. They forecasted that the Central Arctic Ocean will have a significant ice cover during the rest of the year, which thereby hinder routine commercial navigation.

Another study made in 2005 at the University of Arizona concludes that at the present rate, a summer ice-free Arctic Ocean within a century is a real possibility.¹¹⁸ This means that it will still be covered with ice during most of the year. The ACP argues that a route through the Arctic is highly speculative given the present uncertainties around the magnitude of the ice cover, and that it in any case would only be partially viable for commerce during just a few months of the year. In addition the route would have little port connectivity, comprise Canadian jurisdictional waters and expose vessels to the danger of floating ice. Furthermore the speculation is that this will occur first within 50 to 100 years, which makes it a competitor first then.¹¹⁹



Figure 4.6 – The Northwest Passage¹²⁰

4.1.8 Distances

The Panama Canals strategic position gives shipping companies the opportunity to reduce voyage distances and thereby costs. Figure 4.7 gives voyage distances in nautical miles between some potential oil trade routes with and without the transit through the Canal.¹²¹

¹¹⁸ American Geophysical Union (2005), Eos Vol. 86 No. 34, http://atoc.colorado.edu/~dcn/reprints/Overpeck_etal_EOS2005.pdf 2009-08-31

¹¹⁹ ACP (2006), *Proposal for the Expansion of the Panama Canal*, p. 26

¹²⁰ Wikipedia, http://en.wikipedia.org/wiki/File:Northwest_passage.jpg 2009-08-31

¹²¹ World Shipping Register, *Sea Distances*, <http://e-ships.net/dist.htm> 2009-10-27

| Destinations | Route via Cape Horn/ Good Hope/Suez* | Route via Panama | Difference |
|-------------------------------|---|---------------------|--------------|
| Luanda – Long Beach | 10,900 | 8,700 | 2,200 |
| Rio – Long Beach | 8,300 | 7,200 | 1,100 |
| Caracas – Long Beach | 11,600 | 3,800 | 7,800 |
| Rotterdam – Long Beach | 13,500 | 7,800 | 5,700 |
| Tripoli – Long Beach | 13,500 | 8,400 | 5,100 |
| Caracas - Shanghai | 12,800 | 9,500 | 3,300 |

* *The shortest route was chosen.*

Figure 4.7 – Distances in nautical miles with and without the Panama Canal.

4.2 The Canal After the Expansion

The Panama Canal Authority sees new challenges and opportunities for the waterway due to a sustained increase in international trade and the consequent increase in the demand for transits through the Canal. In order to assure a growing profitability and optimise the operation of the Canal four main objectives have been set. The objectives of the expansion are to:^{122, 123}

- Achieve long-term sustainability and growth for the Canal’s contributions to Panamanian society through payments to the National Treasury.
- Maintain the Canal’s competitiveness as well as the value added by Panama’s maritime route to the national economy.
- Increase the capacity to capture the growing tonnage demand with appropriate levels of service for each market segment.
- Make the Canal more productive, safe and efficient.

In order to achieve these objectives the Canal Authority has developed an expansion program that consists of three main integrated components:¹²⁴

- Construction of two new lock facilities, one on the Atlantic side and another on the Pacific side, next to the existing ones.
- Excavation of access channels to the new locks and widening of existing navigation channels.

¹²² ACP (2006), *Proposal for the Expansion of the Panama Canal*, p. iii

¹²³ ACP (2006), *Third Set of Locks Project – Fact sheet*, p. 1

¹²⁴ Ibid.

- Deepening of the navigation channels and elevation of Gatun Lake's maximum operating level.

The new locks' chambers will use rolling gates, which are used in almost all existing locks elsewhere with similar dimensions, and tugboats will be used instead of locomotives to position the vessels. On the Atlantic side the new locks will be east of and right next to the existing locks. The approach channel will be 3.2 km (1.9 miles) long and use part of the 1939-excavation done by the U.S. before that project was suspended in 1942 when the U.S. entered the World War II.¹²⁵

On the Pacific side there will be a new approach channel passing by the existing two locks leading up to the new three-step locks situated next to and west of the current channel. After the new locks there will be a 1.8 km (0.6 miles) long access channel connecting the locks with the sea entrance on the Pacific Ocean. The new channels will be at least 218 meters (715 feet) wide, which will permit post-Panamax vessels to navigate in these channels in one single direction at a time.¹²⁶

¹²⁵ ACP (2006), *Proposal for the Expansion of the Panama Canal*, p. 4

¹²⁶ *Ibid.*, p. 5

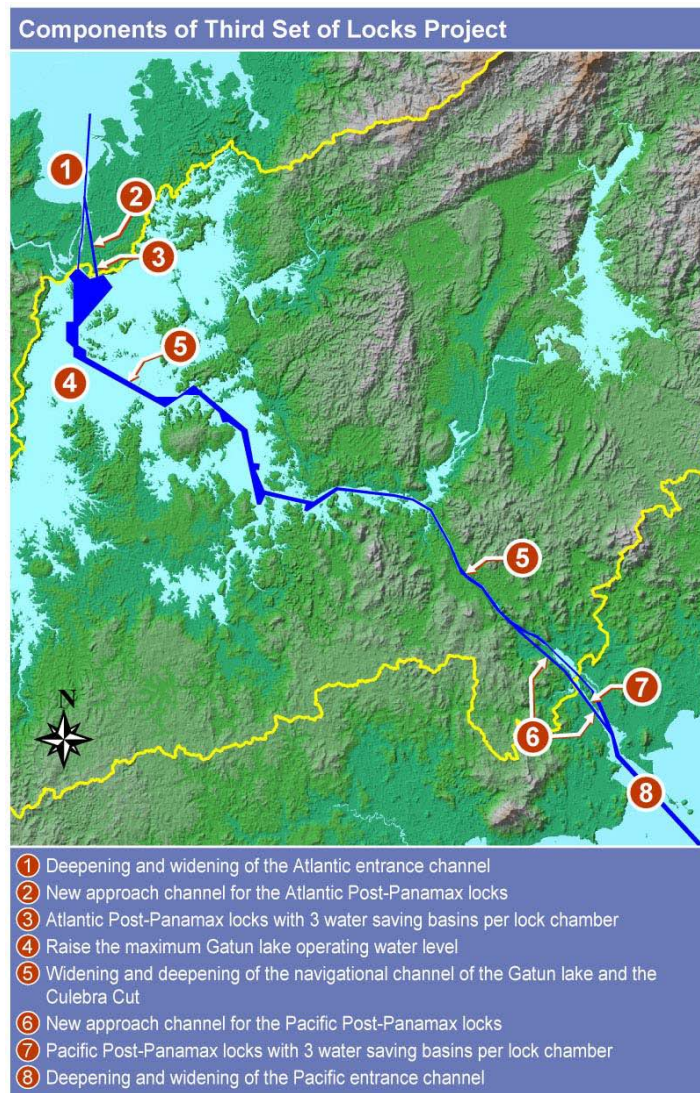


Figure 4.8 – Components of Third Set of Locks Project.¹²⁷

¹²⁷ ACP (2006), *Proposal of the Panama Canal Expansion*, p. 3

4.2.1 The New Dimensions

The locks to the Atlantic and to the Pacific both have the same dimensions and they set the limits to what size that can pass through the Canal. A big problem when dimensioning the locks is that the amount of water that has to be used every time a ship passes through increases exponentially to the size of the locks.¹²⁸

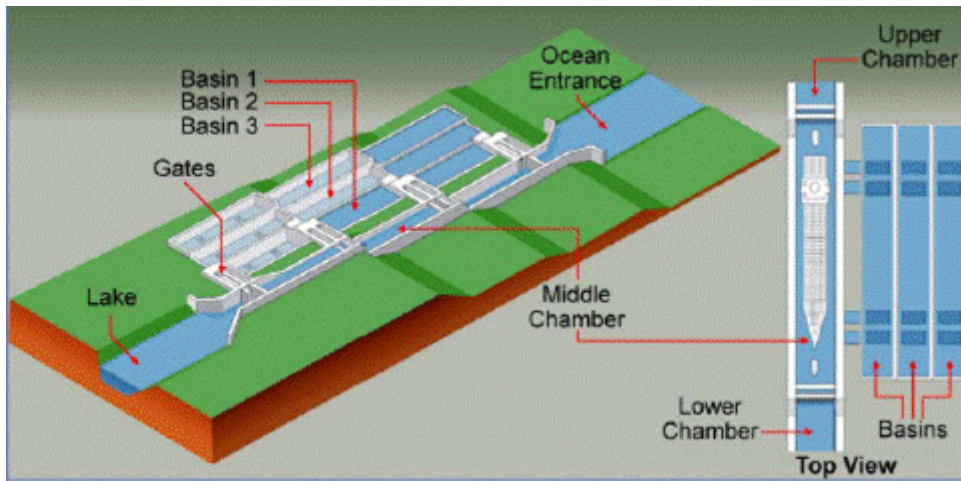


Figure 4.9 – The third set of locks.¹²⁹

Locks

The lock chamber sizes have been established with a post-Panamax containership as reference since that vessel has been identified as the largest type of vessel that carries in the routes with the greatest frequency, volume and intensity would regularly deploy in transiting the canal.¹³⁰

The new lock chambers will be 427 meters long (1,400 feet), 54.9 meters wide (180 feet) and 18.3 meters (60 feet) deep.¹³¹

¹²⁸ ACP (2006), *Proposal of the Panama Canal Expansion*, p. 3-4

¹²⁹ *Ibid.*, p. 4

¹³⁰ *Ibid.*, p. 44

¹³¹ *Ibid.*, p. 4

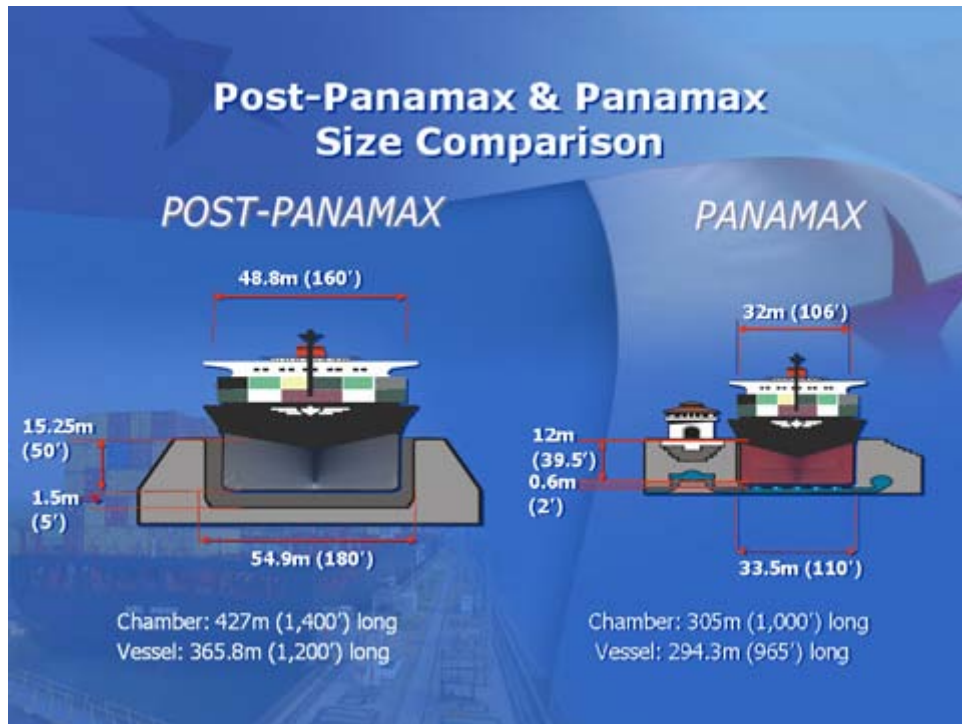


Figure 4.10 – Comparison between Panamax and post-Panamax.¹³²

Vessels

The new locks will allow the transits of vessels with a beam of up to 48.8 meters (160 feet), an overall length of up to 365.8 meters (1,200 feet) and a draft of up to 15.24 meters (50 feet) in tropical fresh water. The clearance to the bottom will be an additional 3 meters (10 feet), not 1.5 meters as shown in figure 4.10.¹³³

4.2.2 Traffic

After the Canal expansion with the third set of locks the maximum sustainable capacity will be approximately 600 million PC/UMS tons per year, nearly twice as much compared to the maximum today.¹³⁴

According to Clarkson Tanker Register Aframax vessels will be able to transit the Canal fully loaded. Even most Suezmax vessels will pass the restrictions if loaded to the correct draft. See figure 4.11.¹³⁵

¹³² ACP (2006), *Proposal of the Panama Canal Expansion*, p. 3

¹³³ ACP (2006), *Third Set of Locks Project – Fact Sheet*, p. 2

¹³⁴ *Ibid.*, p. 5

¹³⁵ Clarkson Research Studies (2006), *Tanker Register*

| Type | Beam | Draft |
|------------------|------|-------------|
| Handy 40-60' | 31.8 | 12.1 |
| Panamax 60-79' | 32.8 | 13.4 |
| Aframax 80-120' | 41.7 | 14.3 |
| Suezmax 120-200' | 46.7 | 16.6 |
| VLCC 200'+ | 58.4 | 21.2 |

Figure 4.11 – Vessel beam and draft dimensions in meters.¹³⁶

4.2.3 Trade

Larger volumes will be able to transit the Canal since Aframax and to some extent Suezmax vessels will pass the restrictions. Some charterer will most likely find new profitable trade routes, especially on the spot market, due to the economies of scale.¹³⁷

4.2.4 Tolls

In order to capture the value the Canal adds in each market segment it serves, a price policy will be used, set by the Panama Canal Authority. This policy will be subject to the following economic criteria:¹³⁸

- Tolls will be established so that they reflect the value provided by the Canal to its users.
- Tolls will be set so that their relative value is maintained over time and will be periodically adjusted to consider inflation.
- Tolls will be established at appropriate levels to maintain the competitiveness of the Panama route at all times and to reach a profitability level in accordance with the risk levels, investments amounts and the value added by the Canal to its users, so that the payments to the National Treasury and the benefits to the Panama are increased in a sustainable manner.
- Tolls will be set at levels that allow the short-term recovery of the investment required to build the third set of locks.

¹³⁶ Clarkson Research Studies (2006), *Tanker Register*

¹³⁷ Jorge J. Corredoira, GAC (2009-09-23), Kristian Aursnes, Litasco (2009-09-23), Mikael Laurin, Laurin Maritime (2009-09-25), Markus Lindbom & Ulf Bäcklund, Stena Bulk (2009-09-14), Amir Osmanagic, Fearnleys (2009-09-28), Magnus Granander, Chinsay AB (2009-09-17)

¹³⁸ ACP (2006), *Proposal for the Expansion of the Panama Canal*, p. 57-58

- Tolls will be applied in the same unbiased manner to all transits regardless of the lock used, since the locks will be used by all kinds of vessels, pursuant to Canal operational requirements.

4.2.5 Potential Benefits of an Expansion

The expansions being made will allow a larger number of transits through the Canal and thereby almost double the capacity.¹³⁹ The increased capacity and reliability will also generate a faster average transit time allowing the shipping companies to save time and thus money.¹⁴⁰ The average vessel size is also expected to increase since the third set of locks allows larger vessels to transit.¹⁴¹ These potential benefits for the tanker industry can be summarized as follows:

- Economies of scale due to the possibility to transit Aframax and Suezmax through the Canal
- Nearly doubled capacity with increased reliability
- Shorter average transit times thanks to less risk of delays

4.3 Summery

The Panama Canal expansion program is, for the ACP and the Panamanian people, an important investment that will give jobs and increase the wealth of the nation. It is clear that the expansion is a well needed investment, not only for the dominate container routes between Asia and the U.S. but also for the tanker industry, which will be able to transit both Aframax and Suezmaxes through the Canal. For the actors on the tanker freight market that is an opportunity to increase trade.

The price for all this is the tolls that the shipowners pay for transiting the Canal, a price that is transferred to the charterers and their customers. The shift by the ACP towards a market oriented toll structure and better services during the last decade has led to increased reliability of the Canal. The expansion will nearly double the capacity of the Canal lowering the average transit times and thus increase the reliability even more.

The new locks will allow the transits of vessels with a beam of up to 48.8 meters (160 feet), an overall length of up to 365.8 meters (1,200 feet) and a draft of up to 15.24 meters (50 feet) in tropical fresh water. This allows loaded

¹³⁹ ACP (2006), *Third Set of Locks Project – Fact Sheet*, p. 5

¹⁴⁰ ACP (2006), *Proposal for the Expansion of the Panama Canal*, p. 18-19

¹⁴¹ ACP (2006), *Third Set of Locks Project – Fact Sheet*, p.4

Aframaxes and to some extent Suezmaxes to transit the Canal. These larger vessels will increase the supply of tonnage in the region and might give the shipowners new profitable trade routes due to economies of scale.

Figure 4.12 summarizes the main differences in meters between the existing and the new locks.

| | Existing locks | New locks |
|---------------------|----------------|-----------|
| Lock chamber length | 305 | 427 |
| Lock chamber width | 33.5 | 54.9 |
| Lock chamber depth | 12.6 | 18.3 |
| Max vessel length | 289.6 | 365.8 |
| Max vessel width | 32.31 | 48.8 |
| Max vessel draft | 12.04 | 15.24 |

Figure 4.12 – Comparison in meters between the existing and the new locks.

5 SCENARIO ANALYSIS

In this chapter the findings are analysed using the two first steps of the working model TAIDATM, which was presented in chapter three. The results from these steps are used to form scenarios of the Panama Canal expansion.

5.1 Preparation

5.1.1 The Purpose of the Scenario Analysis

The purpose of the scenario analysis is to illuminate future opportunities and risks in the tanker freight market that will occur due to the expansion of the Panama Canal. This means that the focus is on old business, not business development or new ideas, and that the aim is to highlight the conditions for change. The goal is to provide risk awareness and to bring forward the need for renewal in order to meet the opportunities.

5.1.2 Time Horizon

Since the Canal expansion is predicted to be in operational use first in 2015 there is a logic need to create scenarios that go beyond that point. In order to get an appropriate time horizon, which is not too complex to handle, the far limit is set to 2020.

5.1.3 History and Current Situation

The history, current situation and the planned expansion of the Panama Canal is presented in chapter 4. Stena Bulk is presented in chapter 1 and the conditions on the tanker freight market are found in chapter 3.2.

5.2 Tracking

5.2.1 Trend Identification

A long perspective has been chosen when identifying the trends affecting the tanker freight market. The financial crisis for example, has not been considered a trend, despite the fact that it has had an impact on the world economic growth together with the more general recession in the western countries. In 2015 when the third set of locks is supposed to go in operational use it is not likely that the financial crisis will have the same impact on the world economic growth as it had the first year after it started in 2008. Instead the idea is to look

at the long lasting trends which affect the tanker freight market and that likely will stretch to 2015 or even beyond that.

The identified long lasting trends affecting the tanker freight market are listed below:

1. World economic growth
2. Increasing supply of tonnage
3. Increasing demand for tanker transportation
4. Increasing governmental regulations
5. Increasing canal tolls
6. Increasing investments in port infrastructure

1. World Economic Growth

Economic growth includes factors such as increased trade and demand for oil and oil products, which have a great impact on the demand for tanker transportation and thus the tanker shipping market.^{142, 143}

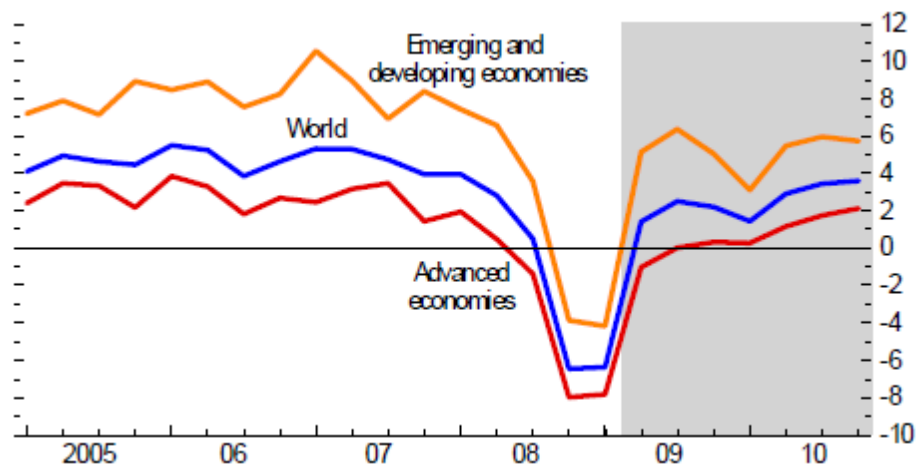


Figure 5.1 – Global GDP growth in %.¹⁴⁴

Since World War II the world GDP growth has remained positive each year.¹⁴⁵ That trend was abruptly broken in 2008 due to the financial crisis. In figure 5.1 the global GDP growth is shown in % quarter-over-quarter annualized.

¹⁴² Stopford, M. (2009), *Maritime Economics*, p. 140

¹⁴³ Concordia Maritime (2009), *Årsredovisning 2008*, p. 8

¹⁴⁴ IMF, *World Economic Outlook July 09*,

<http://www.imf.org/external/pubs/ft/weo/2009/update/02/pdf/0709.pdf>

2009-10-26

According to the IMF global activity is forecast to contract by 1.4 % in total 2009. Despite that and due to a fast and relatively strong recovery of the growth in some emerging and developing economies, mainly in Asia, the world GDP growth is expected to increase over the years that follow. In 2010 the global activity is expected to expand by 2.5 %.¹⁴⁶

The importance of the emerging economies is concretised by the managing director of the IMF, which projects that China will have an economic growth of 8.5 % in 2009:

*“China is leading the world out of recession and has a key role to play in the longer-term reform and rebalancing of the global economy”*¹⁴⁷

2. Increasing Supply of Tonnage

The supply trend is a little bit complex since it is more or less cyclic. During most of the mid 00's the tanker freight market has been strong which has led to newbuilding orders and to fewer ships scrapped, and consequently the supply of tonnage has increased in order to meet the demand. From the time a vessel is being ordered there is a delay until it reaches the freight market, so even if the freight market at the moment is very weak, it will continue to come out new vessels from the shipyards. This effect is somewhat being subdued by increased scrapping due to age and new regulations but the surplus of tonnage will continue.¹⁴⁸

Since the supply of tonnage tends to be cyclic it is possible that there will be decrease in supply when the demand for tanker transport accelerates and enough vessels have been scrapped due to age and/or regulations.¹⁴⁹

It is important to stress that the average economic life of a ship is about 25 years so only a small portion of the fleet is scrapped each year.¹⁵⁰ In 2008 only 1 % of the tanker fleet were scrapped.¹⁵¹ And the order book share in

¹⁴⁵ IMF, *World Economic Outlook Jan 09*,
<http://www.imf.org/external/pubs/ft/weo/2009/update/01/pdf/0109.pdf>
2009-10-26

¹⁴⁶ IMF, *World Economic Outlook July 09*,
<http://www.imf.org/external/pubs/ft/weo/2009/update/02/pdf/0709.pdf>
2009-10-26

¹⁴⁷ Dominique Strauss-Kahn, *MD of the IMF*,
<http://www.imf.org/external/np/sec/pr/2009/pr09408.htm> 2009-11-16

¹⁴⁸ Lars Heisselberg, *GAC*, 2009-09-25

¹⁴⁹ Niklas Bengtsson, *LR Fairplay*, 2009-09-25

¹⁵⁰ Stopford, M. (2009), *Maritime Economics*, p. 151

¹⁵¹ Concordia Maritime (2009), *Årsredovisning 2008*, p. 16

comparison to the total tanker fleet in deadweight ton was a record high 44 % that year.¹⁵²

For the next five years the number of vessels is expected to grow with around 2 % per year and the fleet size in deadweight ton with over 5 % per year.¹⁵³

3. Increasing Demand for Tanker Transportation

Another important trend is that the demand for tanker transportation is increasing, even if right now not in the same pace as the fleet capacity.^{154, 155} In the long run the increased demand for tanker transportation is mainly because of the world economic growth, which is now upheld by the financial crisis. Economic growth triggers the demand for oil and thus the demand for transporting it.¹⁵⁶ Another important factor is transportation length, which is increasing due to the trend that expansion of refining capacity currently is taking place in locations far from the end-users, mainly in the oil producing countries nearer the oilfields.^{157, 158, 159}

4. Increasing Governmental Regulations

Increasing focus on environmental issues, mainly due to climate change concerns, has gradually led to tougher environmental laws around the world.^{160, 161, 162} The governmental environmental regulations have a great impact on the refineries having to meet increasing legislative pressure in order to survive.¹⁶³

There are no signs that there will be less environmental regulations and laws in the future. The United Nations climate change conference in Copenhagen in

¹⁵² Concordia Maritime (2009), *Årsredovisning 2008*, p. 15

¹⁵³ LR Fairplay, *Shipbuilding Market Report*,

http://www.lrfairplay.com/About/Company_news/Shipbuilding_Market_Report_Tankers.html 2009-09-24

¹⁵⁴ Ibid.

¹⁵⁵ Niklas Bengtsson, *LR Fairplay*, 2009-09-25

¹⁵⁶ Ibid.

¹⁵⁷ Stopford, M. (2009), *Maritime Economics*, p. 442

¹⁵⁸ Ulf Bäcklund & Markus Lindbom, *Stena Bulk*, 2009-09-14

¹⁵⁹ Concordia Maritime (2009), *Årsredovisning 2008*, p. 11

¹⁶⁰ Ibid.

¹⁶¹ Ethical Investment, http://www.ethicalinvestment.co.uk/Ethical_Investments.htm 2009-10-29

¹⁶² Goldman Sachs, *Portfolio Strategy*, <http://www2.goldmansachs.com/ideas/environment-and-energy/goldman-sachs/port-strat-growing-interest-pdf.pdf> 2009-10-29

¹⁶³ Reuters, <http://www.reuters.com/article/pressRelease/idUS132500+09-Oct-2009+BW20091009> 2009-10-29

December 2009, for example, is more likely to suggest more regulations than fewer.¹⁶⁴

5. Increasing Canal Tolls

Important canals such as the Panama and Suez have not only been doing investments to please the shipping companies, they want to maximize their profits. From the year 2000 when the Panamanian state took control of the Canal from the U.S. they have changed the price-policy from just seeking to cover the operating costs to a more market oriented model that turns the Canal to an important economic income through increased services and tolls.¹⁶⁵ This trend is both complex and uncertain.

6. Increasing Investments in Port Infrastructure

As the world economic growth continues along with increasing demand for seaborne trade, the investments in port infrastructure have been made to meet the demand for increased capacity. In many ports the investments have not been large enough to meet the demand, which has led to capacity problems. This trend is both complex and uncertain.

5.2.2 Stakeholder Identification

The main stakeholders in the Panama Canal expansion and their motives were identified and divided in the following groups:

- Shipowners (shipping companies)
 - Larger trade volumes, new trade routes
- Charterers (oil companies)
 - New markets, economies of scale
- Shipbrokers (shipbroking companies)
 - Increased trade activity
- Ports (port companies and agencies)
 - Increased need for port services
- ACP (the Panama state and people)
 - Increased income from the Canal, job opportunities
- Construction companies
 - Revenues from construction contracts

¹⁶⁴ COP15 (2009), <http://en.cop15.dk/> 2009-11-02

¹⁶⁵ ACP (2006), *Proposal for the Expansion of the Panama Canal*, p. 1-2

5.3 Analysing

5.3.1 Cross Impact Analysis

In order to understand the importance and interaction of the different trends a cross impact analysis is presented in figure 5.2:

1. World economic growth
2. Increasing supply of tonnage
3. Increasing demand for tanker transportation
4. Increasing governmental regulations
5. Increasing canal tolls
6. Increasing investments in port infrastructure

| Trend | 1 | 2 | 3 | 4 | 5 | 6 | Total: |
|--------|----|----|---|---|---|---|--------|
| 1 | - | 2 | 2 | 1 | 1 | 2 | 8 |
| 2 | 0 | - | 0 | 0 | 0 | 1 | 1 |
| 3 | 1 | 2 | - | 1 | 1 | 1 | 6 |
| 4 | -1 | 0 | 2 | - | 0 | 0 | 3 |
| 5 | 0 | -1 | 0 | 0 | - | 1 | 2 |
| 6 | 1 | 1 | 0 | 0 | 0 | - | 2 |
| Total: | 3 | 6 | 4 | 2 | 2 | 5 | - |

Figure 5.2 – CIM-analysis of the trends on the tanker freight market.

World economic growth, represented by the green row, was identified as the most driving of the trends. The increasing supply of tonnage, represented by the orange column, was identified as the most dependent.

In order to create a clearer picture of this analysis a diagram was created, shown in figure 5.3. The diagram is based on the values in figure 5.2 and the most driving and dependent trends are encircled.

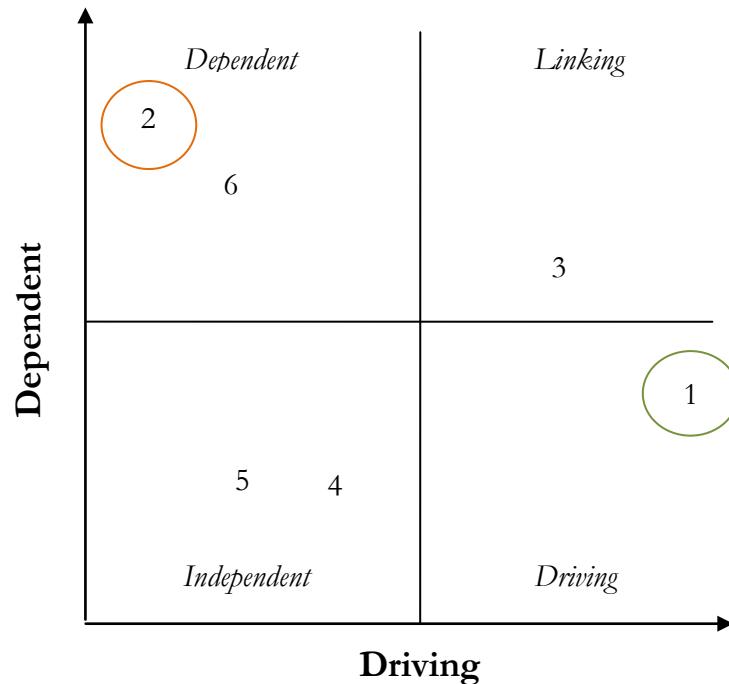


Figure 5.3 – Cross impact diagram

5.3.2 Timeline Scenario

In order to get a better understanding of the business environment the trends and their impact on each other, a descriptive timeline is created based on the more safe trends presented during the tracking phase. It describes in short the most probable background scenario starting in 2010 and ending in 2020 where the different, more uncertain, scenarios take place.

In 2010 the impact from the financial crisis is becoming weaker. Instead a more ordinary recession, in the developed countries in general and in the U.S. in particular, has taken its place in terms of high unemployment and budget deficits. After the climate change conference in Copenhagen the forming of environmental restrictions are in focus.

2011 the developing economies in Asia with China in the lead have recovered and are growing even more rapidly. Increasing trade helps the western economies back on their feet. The weak tanker freight market and oversupply of tanker tonnage has taken its toll and most of the shipping companies have suffered severely.

2012 the demand for oil and oil products in the U.S. and Europe is growing but not by far in the same pace as in Asia. The refinery capacity has increased in the oil producing countries due to environmental legislation in the oil product consuming countries.

2013 Due to scrapping of old and single-hull vessels and more importantly increasing demand for tanker transportation, the oversupply of tanker tonnage is decreasing. The transportation of oil products, which is now done over longer distances, uses larger vessels due to economic of scale.

2014-15 The centennial of the Panama Canal is celebrated and the third set of locks is alleged to be completed, despite some obvious delays in the expansion program. All the attention gives Panama an extra boost in their economy. In the late 2015 the third set of locks is finally taken in a broad operational use. Tankers with Caribbean oil and petroleum products are still a major part of the tanker segment that transits through Panama.

2016-18 Oil and oil products are being transported through the Canal in Aframax and Suezmaxes in both old and new trade routes. Since more and larger vessels have become available on the spot market, due to the fact that they can now transit the Canal, the supply of tanker tonnage has increased in the region. Aframax, which was widely used in the Mexican Gulf even before the expansion, now becomes the dominate vessel type of the region. Due to their will to diversify export routes, the Venezuelan oil plays a more important part in tanker transits through the Canal and so does the Brazilian oil found in the vast Tupi fields a decade ago.

2019-20 More than ten years later no one talks about the financial crisis. Especially not in some of the developing countries that now have economies stronger than some of the Western. The World's GDP is continuously growing, securing an increase of the demand for transporting oil and petroleum products.

5.3.3 Critical Uncertainties

Increasing canal tolls and increasing investments in port infrastructure were identified as the two most uncertain trends to predict in 5.2.1. These two trends are also believed to have a great impact on the development of the Panama Canal. In order to understand the impact of different levels and combinations of these trends a scenario cross was created, revealing four different scenarios in 2020.

The horizontal axis in figure 5.3 shows different focus on the port infrastructure in the Panama region. If the focus lies on just maintaining the

port capacity of today, a scenario on the left side is probable. If the focus lies on meeting the future needs, i.e. large port investments, a scenario on the right side is probable.

The vertical axis shows how the Panama Canal Authority, and ultimately the people of Panama, will set the Canal tolls. If the tolls are set to meet the State budget costs it will most likely soar and those scenarios are found above the horizontal axis. If the tolls, on the other hand, are set on market based grounds only, it would theoretically fall after the expansion due to increased capacity.

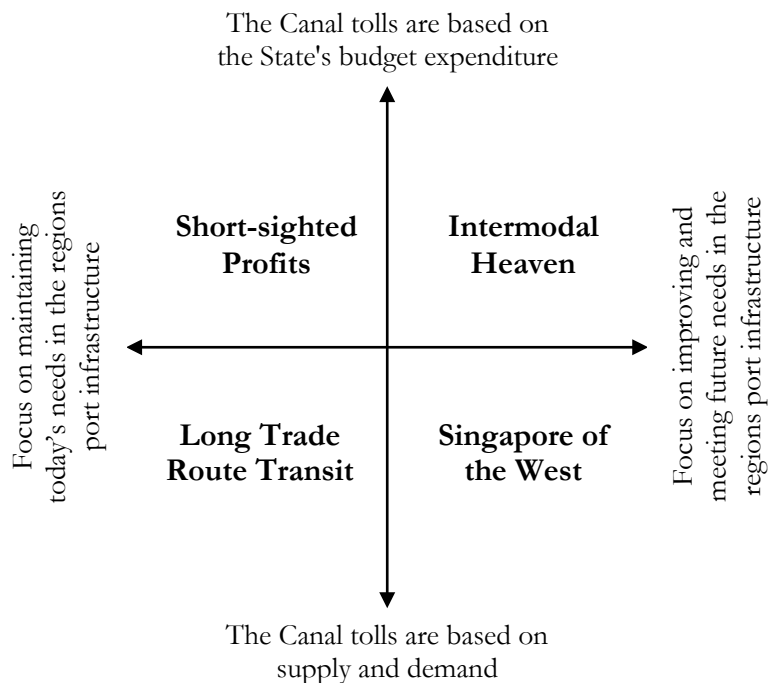


Figure 5.4 – Scenario cross predicting four different scenarios.

Intermodal Heaven

The Panamanian society is growing and the expansion of the Canal has given Panama the opportunity to rise as a wealthier nation. The people in Panama feels that the investments in the expansion and in port facilities and services have somewhat paid off, and they are willing to invest even more to increase that income.

Nearby countries in the region also want their share of the increasing trade due to the World economic growth and the Canal expansion. They want to follow

the Panama example with investments in port infrastructure. Since none of the other countries have a canal such as the Panama Canal they focus on intermodal solutions to encourage trade.

The income from the Canal tolls is being used to build more schools, hospitals and to “spread the wealth” just like the former President Martinelli promised. All this has led to an increasing conflict between those who believes that the State budget should concentrate on more port infrastructure investment and those who think that now is the time to invest in the people of Panama. The result is a compromise where increased Canal tolls are the solution for the sitting Government to win the next election.

Soaring Canal tolls concerns the shipping companies worldwide, making them look at the alternatives. And since the intermodal system has become more attractive due to the focus on port investments and more reliable services, more and more trade utilizes that solution.

Short-sighted Profits

The heavy expansion bill combined with a political context that demands investments in social security systems forces the Government to increase the Canal tolls. Due to the increase in traffic through the canal has not yet met the expectations before the expansion, according to many observers because the fees were set too high, substantial increases are required to meet the soaring budget costs.

The Panamanian people do not feel that the investment in the Canal expansion and in port infrastructure has been to their advantage. The general view is that the large international port companies are robbing the people of its only important resource. Giving them more money by investing in infrastructure will not give anything back. Invest in the people instead is the main opinion amongst the citizens.

Most people in Panama believe that the best way to gain from these corrupt companies is to make them pay by raising the Canal tolls. The trade will not stop anyway since the transit is so important is their view.

Long Trade Route Transit

For a long time now, ever since the Panamanians took over the control of the Canal in the year 2000, the strategy of doing business in a market oriented way has been successful. No one questions the importance of maximising the cargo transiting the Canal. New ways to improve the payment methods are being implemented constantly. Reliable and fair Canal tolls are considered the best way of competing with intermodal systems and the Suez Canal.

Despite an increasing importance in global trade, due to the increased capacity the expansion program has given the Canal, the ports in the region is still at the same level as before the expansion. The main reason is that the markets for oil and oil products, amongst other goods, has not grown in the same pace in the relatively poor countries in the Panama region as in the U.S. and Canada markets for example. As the economies around the Panama Canal remains small, so will the investments in their ports infrastructure.

Due to the lack of investments in the region's ports, most of the cargo transiting the Canal is being transported over long distances, especially now when the Canal accepts larger vessels to pass.

Singapore of the West

The optimism after the expansion program is flourishing. More and more people in Panama realises that the Canal is a never ending resource that, if it is rightly treated, can help the country to become a more prosperous and wealthy nation. Just like an oil well, investments must be done to be able to exploit it.

The main perception is that the need for trading goods between the two big oceans will continue to increase and that the best way to exploit this need is to invest in not only the physical capacity, as was done with the expansion program, but also in more and better services for the shipping companies.

The Panama Canal is now a provider of safe, reliable and fast canal and port services and the Panamanians see the country as the hub of the Americas just as important as Singapore is in Asia.

5.4 Summery

The focus on this scenario analysis was on old business and the aim was to highlight conditions for change. The purpose was to provide risk awareness and bring forward the need for renewal in order to meet the upcoming opportunities. The time horizon was set to ten years starting in 2010.

Six important trends were identified in the tanker freight market and just as many main stakeholders in the Panama Canal expansion. World economic growth was identified as the most driving of the trends and the increasing supply of tonnage the most dependent. The two most critical uncertainties have been used in order to illuminate four different scenarios in 2020. The two uncertainties are whether the Panamanian people through ACP will base the Canal tolls on budget expenditure or on supply and demand, and whether

there will be a focus on keeping today's standard of the regions port infrastructure or on improving it to meet the future need.

It became clear that the way the tolls are set is important for the participants on the tanker freight market. An obvious risk is that the tolls from the Canal will be set to high in order to pay for budget deficits, making trade routes unprofitable. Another risk is that port infrastructure in the region will hinder new trade routes. Even if the Canal after an expansion will allow a Suezmax to pass, a port in for an example Honduras might not allow it to enter. In order to allow larger vessels, the ports must invest in infrastructure so that they will not become a narrow sector for trade in the region.

The fact that more and larger vessels will be able to transit the Canal increases the supply of tonnage in the region. This will most likely have a reducing effect on the freight rates.

6 CONCLUSIONS

In this chapter the conclusions that summarises the scenario analysis is presented, in reference to the purpose stated in chapter one. Risks and opportunities from the scenarios of the Panama Canal expansion are illuminated.

Describe and analyse the expansion of the Panama Canal in order to create increased robustness for shipowners in the future development on the tanker freight market.

In order to answer to the stated purpose above a scenario analysis was conducted with the two first steps in the TAIDA™ model; tracking and analysing. The tracking step would describe the Panama Canal, the expansion program, the stakeholders and the business environment on the tanker freight market. The analysing step would use the information from the tracking step and put it in a context. By doing this in both an analytic and creative manner illustrative scenarios could be painted and used in order to increase the robustness for the future development in the tanker freight market created by the expansion. Increased robustness means increased awareness of risks and opportunities in the future.

6.1 Describing the Canal

The tracking step that would describe the expansion of the Panama Canal was extensive. First empirical data about the Panama Canal's history and development was studied. Statistics about vessel types, cargo, tolls and trade routes through the Canal were also important to get an overview. Further on the tanker freight market and its business environment was studied through various models and theories. Interviews with important actors on the freight market were also made in order to collect primary data. All this information was collected and sorted in order to create a map of the past and current situation.

It was made clear that the expansion program was a well needed investment, not only for the dominate container routes between Asia and the U.S. but also for the tanker industry.

With all the information gathered and sorted six important trends affecting the tanker freight market were identified:

1. World economic growth
2. Increasing supply of tonnage
3. Increasing demand for tanker transportation
4. Increasing governmental regulations
5. Increasing canal tolls
6. Increasing investments in port infrastructure

The stakeholders in the Panama Canal expansion were identified as: shipowners, charterers, shipbrokers, ports, ACP and construction companies.

6.2 Analysis

The information gathered during the tracking phase had to be analysed and put in a context in order to find the relation and impact the trends have on each other. A cross impact analysis showed that world economic growth was the most driving of the trends and increasing supply of tonnage the most dependent.

The two most critical uncertainties were identified in order to create a scenario cross, a cross revealing four different future scenarios that will affect the tanker freight market dissimilar. Together with the information from the tracking step these scenarios was illustrative painted in a creative manner.

The two uncertainties were whether the Panamanian people through ACP will base the Canal tolls on budget expenditure or on supply and demand, and whether there will be a focus on keeping today's standard of the regions port infrastructure or on improving it to meet the future need.

6.3 Opportunities and risks

In order to create increased robustness for the future development risks and opportunities has to be identified. The information from the tracking step reveals opportunities with an expanded Canal. Both Aframax and Suezmaxes will be allowed to transit and these larger vessels might give the shipowners new profitable trade routes due to economies of scale.

The expansion will also allow a larger number of transits through the Canal and thereby almost double the capacity. The increased capacity will generate a faster average transit time and thus increased reliability, allowing the shipping companies to save time and thus money. These opportunities can be summarized as follows:

- Economies of scale due to the possibility to transit Aframax and Suezmax through the Canal
- Nearly doubled capacity with increased reliability
- Shorter average transit times thanks to less risk of delays

The Panama Canal expansion program is, for the ACP and the Panamanian people, an important investment that will give jobs and increase the wealth of the nation. For the actors on the tanker freight market it is an opportunity to increase trade but the price for all this is the tolls that the shipowners pay for transiting the Canal, a price that is transferred to the charterers and their customers. The shift by the ACP towards a market oriented toll structure and better services during the last decade has led to increased reliability of the Canal. If this development is changed and a more state budget controlled toll policy is implemented, there is a great risk that the tolls will soar which will affect the tanker freight market negatively.

The focus on the ports infrastructure is also important to study. There is a risk that important ports in the region do not keep up with the investments being made in the Canal. If so, the shipowners will not be able to fully take advantage of economies of scale since the ports cannot allow the larger vessels to enter.

Another risk lies in the fact that the expanded Canal will release tonnage, in form of Aframax and Suezmaxes that before was stuck on either side of the Canal. These vessels will be available on both sides of the Canal after the expansion which will increase the supply of tonnage and thereby lower the price on the tanker freight market in the region.

These main risks can be summarized as follows:

- Changed toll policy can lead to soaring Canal fees
- Lack of port infrastructure reduces the benefits of the expansion
- More and larger available vessels in the region lowers the freight rates

7 REFLECTIONS

This chapter presents additional personal reflections regarding the Panama Canal expansion, recommendations and the conducting of scenario analysis.

7.1 The Panama Canal Expansion

The expansion seems to be a motivated investment in line with the development of a fleet with larger vessels. Economies of scale might give new profitable trade routes or improve old ones but it takes more than just large ships. The ports must be able to handle the larger vessels and in most cases that means big investments. Even if the ports manage to keep up with the investments and thereby will be able to handle the larger ships that pass through the Canal after the expansion, there still has to be a demand for the cargo. It is the demand for oil and oil products that drives the development towards larger vessels and port terminals not the other way around.

As the scenario analysis showed it is the economic growth that is the most driving force on the tanker freight market. With economic growth in the region the demand for tanker transportation will increase and with an expanded and more reliable Canal tanker shipowners will be able to exploit that better than today, especially if they well ahead are aware the consequences of the expansion.

7.2 Recommendation

My recommendation to the tanker shipowners that operates vessels through the Canal is based on what I have learned during the conduct of this scenario analysis.

In order to fully take advantage of an expanded Canal I recommend the tanker shipowners to start analyze the current and possible future trade routes via Panama. It is not only the opportunity to transit the Canal with more cargo that will benefit shipowners. The fact that the tolls today are based on whether the ship is laden or not opens up cost saving operations, e.g. a Suezmax that today transports crude oil from West Africa to U.S. West Coast via Cap Horn would be able to take the safer and time saving ballast leg through the Canal on its way back.

The suggested analysis should include the following components:

- Identify and list all possible profitable and non-profitable routes that use or would be able to use the Canal. Include future routes from new oil-fields such as the Tupi field outside Brazil.
- List different freight rates, canal tolls and vessel types on each route.
- Experiment with different vessel sizes and freight rates and analyze what it takes in order get the non-profitable routes profitable.
- Are there any barriers that can be changed by developing customized and innovative transport solutions?
- Specify the profitable trade routes and what the requirements are.

This will give the shipowner a broader and clearer view of the future routes. By acting proactive the shipowner seizes the initiative before the competitors and can be first in exploiting the new trade routes, e.g. begin to make the right connections.

7.3 The Conducting of a Scenario Analysis

To conduct a scenario analysis is a very learning and developing way to understand a specific business arena. Doing it alone really put me on trial and I am convinced that a scenario analysis can be even more productive if it is carried out by a specialist group. I sincerely recommend the models and methods for both learning and analysing purposes.

For further research and/or implementation the strategic planning methods, i.e. the three remaining steps of the TAIDA™ model can be used.

REFERENCES

Literature

- Björklund, M. & Paulsson, U. (2003) *Seminarieboken*, Studentlitteratur AB, Lund
- Concordia Maritime AB (2008) *Årsredovisning*, Concordia Maritime AB, Göteborg
- Denscombe, M. (2009) *Forskningshandboken*, Studentlitteratur AB, Lund
- Gorton, L. & Ihre, R. & Sandevärn, A. (1989) *Befraktning*, Liber Hermods, Malmö
- Gorton, L. & Ihre, R. & Sandevärn, A. (1990) *Shipbroking and Chartering Practice*, Liber Hermods, Malmö
- Höst, M. & Regnell, B. & Runeson, P. (2006) *Att genomföra examensarbete*, Studentlitteratur AB, Lund
- Johnson, G. & Scholes, K. (2005) *Exploring Corporate Strategy*, Pearson Education Ltd., Essex
- Lindgren, M. & Bandhold, H. (2008) *Scenarioplanering*, Uppsala Publishing House AB, Uppsala
- Merriam, S. M. (1994) *Fallstudien som forskningsmetod*, Studentlitteratur AB, Lund
- Roos, G. & von Krogh, G. & Roos, J. (2004) *Strategi – en introduktion*, Studentlitteratur AB, Lund
- Stopford, M. (2009) *Maritime Economics*, Routledge, New York
- Quinn Patton, M. (2002) *Qualitative Research & Evaluation Methods* (3rd edition) SAGE Publications Inc., California
- Yin, R.K. (2006) *Fallstudier: design och genomförande*, Liber AB, Malmö

Internet

- ACP (2006), *Proposal for Expansion of the Panama Canal – Third Set of Locks Project*, <http://www.pancanal.com/eng/plan/documentos/propuesta/acp-expansion-proposal.pdf> 2009-08-04
- ACP (2006), *Third Set of Locks Project – Fact Sheet*, http://www.embassyofpanamainjapan.org/pdf/panama_expansion/7-1-eng-fact-sheet-3rd-set-locks.PDF 2009-08-04
- ACP (2008), *The Panama Canal Expansion Program: An Innovative Approach to Infrastructure and Expansion of a Green Route*, <http://www.fasterfreightcleanerair.com/pdfs/Presentations/FFCAEC2008/Alberto%20Zubierta.pdf> 2009-09-01
- ACP (2008), *Tolls Assessment*, <http://www.pancanal.com/eng/maritime/tolls.html> 2009-08-26
- ACP (2009), *Canal FAQ*, <http://www.pancanal.com/eng/noticiero/canal-faqs/index.html> 2009-08-26
- ACP (2009), *Transit Statistics*, <http://www.pancanal.com/eng/maritime/statisti.html> 2009-08-26
- ACP (2009), *Panama Canal Tolls*, <http://www.pancanal.com/eng/general/peajes-en-el-canal.html> 2009-08-24
- ACP (2009), *This is the Canal*, <http://www.pancanal.com/eng/general/asi-es-el-canal.html> 2009-08-27
- ACP (2009), *Vessel Requirements*, <http://www.pancanal.com/eng/maritime/notices/2009/n01-2009.pdf> 2009-09-23
- American Geophysical Union (2005), *Eos Vol. 86 No. 34*, http://atoc.colorado.edu/~dcn/reprints/Overpeck_etal_EOS2005.pdf 2009-08-31
- BBC News (2006), *Panamanians back canal expansion*, <http://news.bbc.co.uk/2/hi/americas/6074106.stm> 2009-06-23
- Bijo, M. (2004), *Cost & Benefit Analysis – Proposals*, <http://www.fenixpanama.com/Panama-canal-expansion-2.html> 2009-09-23
- COP15 (2009), <http://en.cop15.dk/> 2009-11-02
- Ethical Investment (2009), http://www.ethicalinvestment.co.uk/Ethical_Investments.htm 2009-10-29
- Goldman Sachs, *Portfolio Strategy*, <http://www2.goldmansachs.com/ideas/environment-and-energy/goldman-sachs/port-strat-growing-interest-pdf.pdf> 2009-10-29

- Hannafin, Matt (2009), *Selection of Construction Proposal Advances Panama Canal Expansion*, <http://www.frommers.com/articles/6157.html> 2009-08-04
- IMF – *World Economic Outlook Jan 09*, <https://www.imf.org/external/pubs/ft/weo/2009/update/01/pdf/0109.pdf> 2009-09-30
- IMF – *World Economic Outlook Jul 09*, <https://www.imf.org/external/pubs/ft/weo/2009/update/02/pdf/0709.pdf> 2009-09-30
- Jimmy Carter Library, *The Daily Diary Of President Jimmy Carter*, <http://jimmycarterlibrary.org/documents/diary/1977/d090777t.pdf> 2009-08-27
- Makkar, Jagmeet – *Shipping Markets*, http://www.seatransport.org/seaview_doc/Ed_72/ICS%20column%20-%20Shipping%20Markets.doc 2009-09-30
- IEA (2009), *Key World Energy Statistics*, http://www.iea.org/Textbase/nppdf/free/2009/Key_Stats_2009.pdf 2009-09-24
- ISL (2007), *World Tanker Fleet*, http://www.isl.org/products_services/publications/pdf/COMM_3-2007-short.pdf 2009-09-30
- Lloyd's Register, *Modern Ship Sizes Definitions*, <http://www.lr.org/NR/rdonlyres/84FA572A-21EA-4C82-B8A2-FA576591A064/56300/Info30Shipsizes.pdf> 2009-08-09
- LR Fairplay (2009), *Shipbuilding Market Report*, http://www.lrfairplay.com/About/Company_news/Shipbuilding_Market_Report_Tankers.html 2009-09-24
- Reuters, <http://www.reuters.com/article/pressRelease/idUS132500+09-Oct-2009+BW20091009> 2009-10-29
- Stena Bulk, *Business Concept*, <http://www.stenabulk.com/en/TheCompany/Business-Concept/> 2009-07-03
- UNCTAD (2008), *Review of Maritime Transport*, http://www.unctad.org/en/docs/rmt2008_en.pdf 2009-10-27
- U.S. Arctic Research Commission, *The Arctic Ocean And Climate Change: A Scenario for the US Navy*, http://www.arctic.gov/publications/arctic_and_climate_change.pdf 2009-08-31
- USA Today, *For Panama Canal, a new era of trade is coming*, http://www.usatoday.com/money/world/2009-08-05-enlarged-panama-canal_N.htm 2009-08-27
- USA Today, *Plan to enlarge Canal stirs up controversy*, http://www.usatoday.com/money/world/2006-06-18-panama-canal-usat_x.htm 2009-09-28
- World Shipping Register, *Sea Distances*, <http://e-ships.net/dist.htm> 2009-10-27

Interviews

Aursnes, Kristian – *Crude Oil Chartering Manager*, Eiger Shipping Geneva, 2009-09-23

Bengtsson, Niklas – *Project Manager and Senior Consultant*, LR Fairplay Gothenburg 2009-09-25

Berggård, Stefan – *Assistant Manager Commercial Operations*, Stena Bulk Houston 2009-09-28

Bäcklund, Ulf – *Manager Tanker Chartering*, Stena Bulk Gothenburg, 2009-09-14

Case, Christopher – *Chartering Specialist*, Stena Bulk Houston, 2009-09-25

Duran, Nicolas – *Shipbroker*, Fearnleys Oslo, 2009-09-28

Granander, Magnus – *Marketing Manager*, Chinsay AB Stockholm, 2009-09-17

Hansson, Ola – *Trader*, Litasco Dubai, 2009-09-22

Heisselberg, Lars – *vice President Americas*, GAC Houston, 2009-09-16

Laurin, Mikael – *Managing Director*, Laurin Maritime Gothenburg, 2009-09-25

Lindbom, Markus – *Manager Commercial Operations*, Stena Bulk Gothenburg, 2009-09-14

Osmanagic, Amir – *Shipbroker*, Fearnleys Oslo, 2009-09-28

von Platen, Philip – *Junior Restructuring Officer*, DVB Bank Rotterdam, 2009-11-20

Uggla, Robert – *Managing Director*, Broström Gothenburg 2009-09-22

APPENDIX

Interview Guide in English

Background

- What is your background?
 - o Education?
 - o Previous work experience?
- How long have you been at your present job?
- What are your main duties/responsibilities?

Generally, the tanker industry (freight market)

- What are the three most driving factors affecting freight rates (with a short motivation)?
- How would you describe the current situation of the tanker industry?
- What do you see as the future for the tanker industry?

Panama Canal

- Have you in your job been in contact with the ACP (Panama Canal Authority)?
- What are your views on the Panama Canal today?
 - o Implications for global trade
 - o Significance of the oil trade in the region
- On which of the above-mentioned driving factors in the tanker industry will the expansion of the canal have an impact?
- What are the trade routes of tankers passing through the Panama Canal?
- How will the expansion affect existing trade routes for tankers?
- Is it likely that the expansion will create new trade routes for crude oil/products?

- If so, what trade routes?
- What types of vessels (tankers) primarily operates in the Caribbean/Panama region?
- What type of charterer in the tanker segment uses the Panama Canal?
- How will the expansion most likely affect the various ship classes (freight rate, number)?
 - Panamax
 - Aframax
 - Suezmax
- What do you know about the ports in general in the Panama region?
 - Depth, capacity, congestion etc.
 - After the expansion, will the ports in the Gulf region become a narrow sector rather than the Canal?
- What do you know about the refineries in the region (main location, congestion etc.)?

Interview Guide in Swedish

Bakgrund

- Vilken bakgrund har du?
 - Utbildning?
 - Tidigare arbetslivserfarenheter?
- Hur länge har du varit på ditt nuvarande jobb?
- Vilka är dina huvudsakliga uppgifter/ansvarsområden?

Generellt om tankerbranschen (fraktmarknaden)

- Vilka är de tre mest drivande faktorer som påverkar fraktraterna (med kort motivation)?
- Hur skulle du beskriva dagens situation för tankerbranschen?
- Hur ser du på den framtida situationen för tankerbranschen?

Panamakanalen

- Har du i ditt jobb varit i kontakt med ACP (Panama Canal Authority)?
- Vad har du för syn på Panamakanalen idag?
 - o Betydelse för världshandeln
 - o Betydelse för oljehandeln i regionen
- Vilka av tidigare nämnda drivande faktorer för tankerbranschen kommer expansionen av kanalen att påverka?
- Vilka handelsvägar för tankerfartyg går genom Panamakanalen?
- Hur kommer expansionen påverka befintliga handelsvägar för tankerfartyg?
- Är det troligt att det skapas nya handelsvägar för tankerfartyg genom kanalen tack vare expansionen?
 - o I så fall vilka?
- Vilka fartygstyper (tankers) opererar främst i Karibien/Panamaregionen?
- Vilken typ av befraktare inom tankersegmentet använder Panamakanalen?
- Vilka är de troligaste förändringarna (fraktrater, antal) för de olika fartygsklasserna i och med expansionen?
 - o Panamax
 - o Aframax
 - o Suezmax
- Vad vet du om hamnarna i regionen?
 - o Djup, kapacitet, vilka fartyg kan de ta emot
 - o Utgör de en trång sektor när expansionen är klar
- Vad vet du om raffinaderierna i regionen? (Huvudsaklig placering, är de överbelastade, var kommer oljan ifrån och vart går oljeprodukterna därefter)

Charts

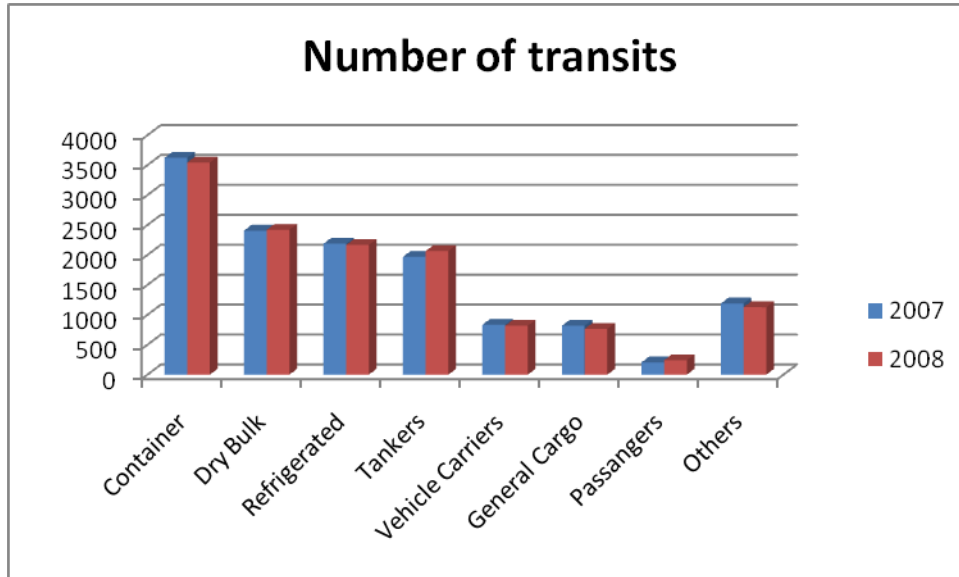


Chart 1 – Number of transits through the Panama Canal.¹⁶⁶

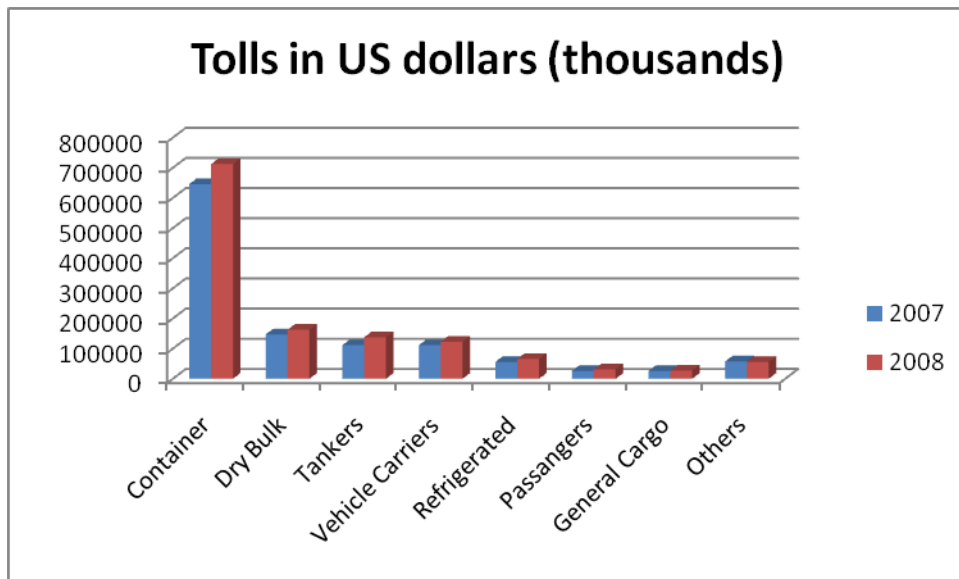


Chart 2 – Total tolls in US dollars (thousands).¹⁶⁷

¹⁶⁶ ACP (2009), *Transit Statistics*, <http://www.pancanal.com/eng/maritime/statisti.html>
2009-08-26

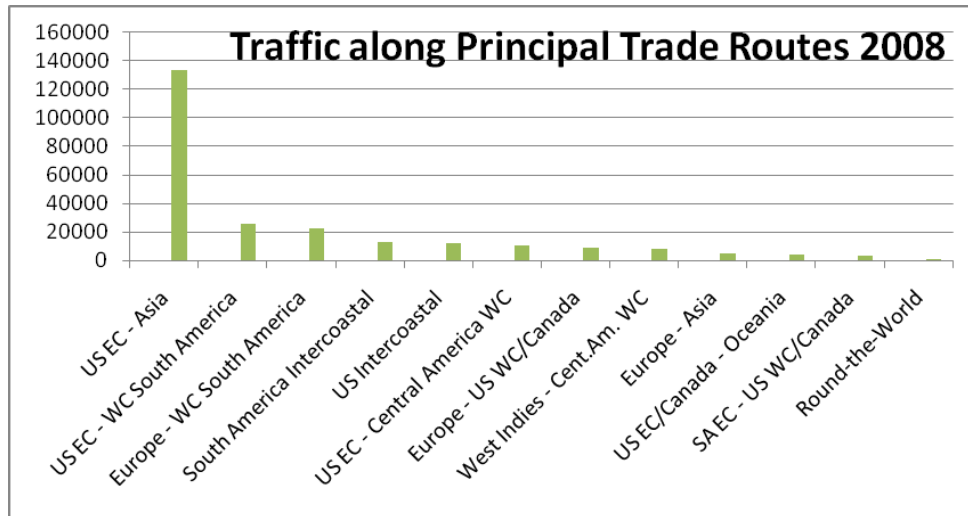


Chart 3 – Number of vessels along principal trade routes in 2008.¹⁶⁸

| Market Segment | | 2007 | | | | 2008 | | | | 2009 | | | |
|---|---------|------------------|---------|---------|------|------------------|---------|---------|------|------------------|---------|---------|------|
| | | Effective 1st of | | | | Effective 1st of | | | | Effective 1st of | | | |
| TEU Toll | | | | | | | | | | | | | |
| Full Containers | Laden | May | 54.00 | | | May | 63.00 | | | May | 72.00 | | |
| | Ballast | | 43.20 | | | | 50.40 | | | | 57.60 | | |
| On-Deck Container Toll in other vessels | Laden | May | 54.00 | | | May | 63.00 | | | May | 72.00 | | |
| Toll per berth | | | | | | | | | | | | | |
| Passenger Vessels 1/ | Laden | October | 100.00 | | | October | 115.00 | | | October | 120.00 | | |
| | Ballast | | 80.00 | | | | 92.00 | | | | 96.00 | | |
| Tolls per PC/UMS Ton | | | | | | | | | | | | | |
| | | Effective 1st of | 1st 10K | 2nd 10K | Rest | Effective 1st of | 1st 10K | 2nd 10K | Rest | Effective 1st of | 1st 10K | 2nd 10K | Rest |
| General Cargo | Laden | Jul | 3.26 | 3.19 | 3.14 | May | 3.63 | 3.56 | 3.50 | May | 3.90 | 3.82 | 3.76 |
| | Ballast | | 2.59 | 2.53 | 2.49 | | 2.88 | 2.82 | 2.77 | | 3.10 | 3.03 | 2.98 |
| Refrigerated Cargo | Laden | Oct | 3.39 | 3.32 | 3.26 | Oct | 3.80 | 3.72 | 3.65 | Oct | 3.80 | 3.72 | 3.65 |
| | Ballast | | 2.69 | 2.63 | 2.59 | | 3.01 | 2.95 | 2.90 | | 3.01 | 2.95 | 2.90 |
| Dry Bulk | Laden | Jul | 3.20 | 3.13 | 3.08 | May | 3.50 | 3.43 | 3.37 | May | 3.73 | 3.65 | 3.59 |
| | Ballast | | 2.54 | 2.48 | 2.44 | | 2.78 | 2.72 | 2.67 | | 2.96 | 2.90 | 2.85 |
| Tankers | Laden | Jul | 3.29 | 3.22 | 3.16 | May | 3.70 | 3.63 | 3.57 | May | 3.98 | 3.92 | 3.85 |
| | Ballast | | 2.61 | 2.55 | 2.51 | | 2.94 | 2.88 | 2.83 | | 3.18 | 3.11 | 3.05 |
| Vehicle Carriers | Laden | Jul | 3.24 | 3.18 | 3.12 | May | 3.60 | 3.52 | 3.46 | May | 3.87 | 3.79 | 3.72 |
| | Ballast | | 2.57 | 2.52 | 2.47 | | 2.86 | 2.80 | 2.75 | | 3.07 | 3.01 | 2.95 |
| Passenger Vessels 2/ | Laden | Oct | 3.39 | 3.32 | 3.26 | Oct | 3.80 | 3.72 | 3.65 | Oct | 3.95 | 3.87 | 3.80 |
| | Ballast | | 2.69 | 2.63 | 2.59 | | 3.01 | 2.95 | 2.90 | | 3.14 | 3.07 | 3.02 |
| Others | Laden | Jul | 3.32 | 3.25 | 3.19 | May | 3.78 | 3.70 | 3.64 | May | 4.12 | 4.04 | 3.97 |
| | Ballast | | 2.63 | 2.58 | 2.53 | | 3.00 | 2.94 | 2.89 | | 3.27 | 3.20 | 3.15 |
| Tolls per Displacement Ton | | | | | | | | | | | | | |
| Displacement | | Jul | 1.84 | | | May | 2.09 | | | May | 2.28 | | |

Notes:

1/ Vessels above 30,000 gross tons (GRT) and whose PC/UMS tonnage divided by maximum passenger capacity (PAX-ITC) ratio is less than or equal to 33, shall pay tolls on a per berth basis. If such ratio is greater than 33, tolls shall be paid on the basis of PC/UMS tonnage. Vessels below or equal to 30,000 GRT shall also pay on the basis of PC/UMS tonnage.

Chart 4 – Panama Canal tolls.¹⁶⁹

¹⁶⁷ ACP (2009), *Transit Statistics*, <http://www.pancanal.com/eng/maritime/statisti.html>
2009-08-26

¹⁶⁸ Ibid.

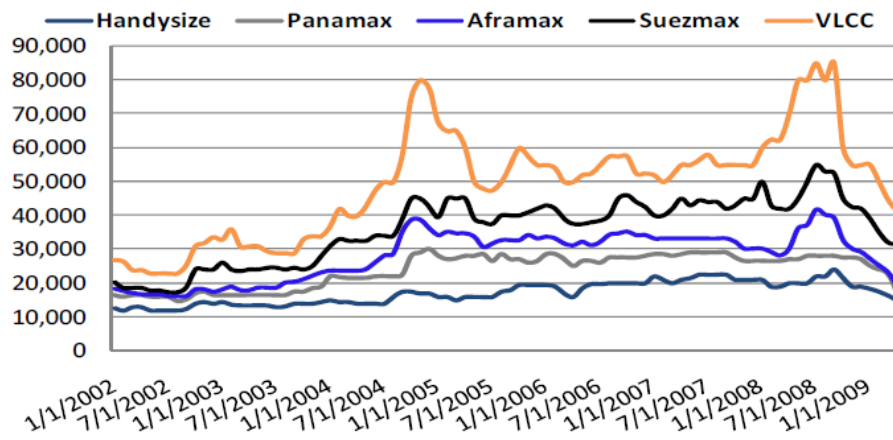


Chart 5 – Monthly time charter rates in US\$/day.¹⁷⁰

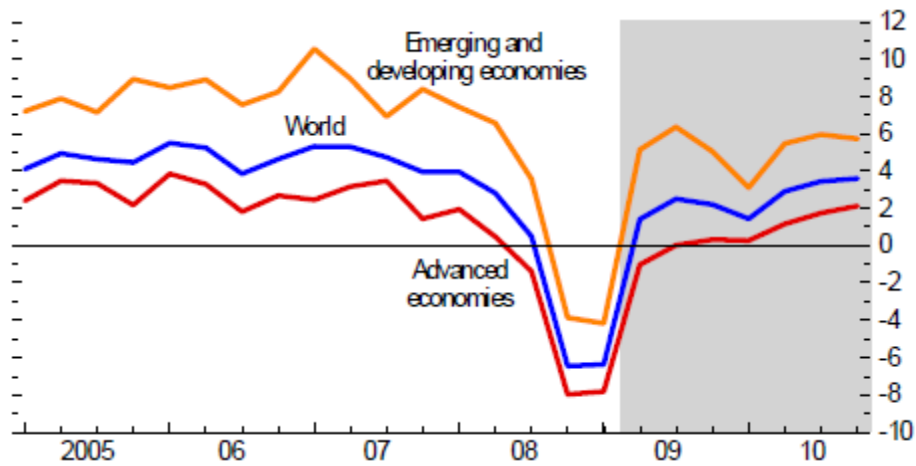


Chart 6 – Global GDP growth in %, quarter-over-quarter, annualized.¹⁷¹

¹⁶⁹ ACP (2008), *Tolls Assesment*, <http://www.pancanal.com/eng/maritime/tolls.html>
2009-08-26

¹⁷⁰ Bloomberg

¹⁷¹ IMF – *World Economic Outlook Jul 09*,
<https://www.imf.org/external/pubs/ft/weo/2009/update/02/pdf/0709.pdf> 2009-09-30

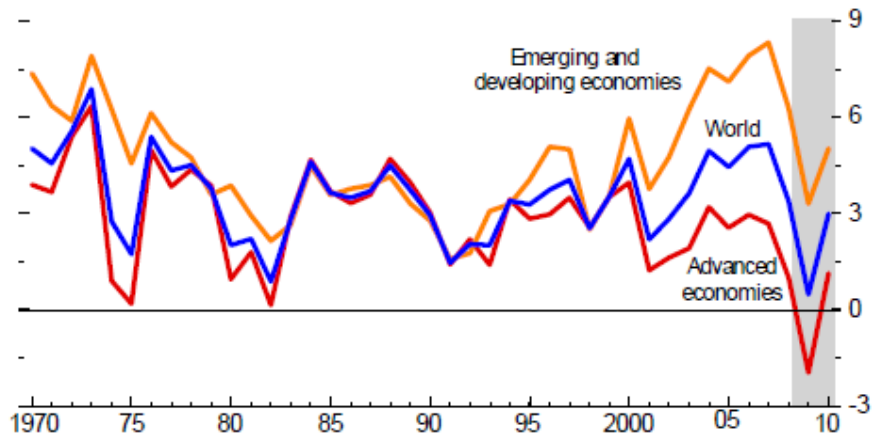


Chart 7 – Global GDP growth in %, quarter-over-quarter, annualized.¹⁷²

| U.S. Ports | MLW |
|------------------------|------|
| Los Angeles/Long Beach | 15.2 |
| Oakland | 15.2 |
| Seattle/Tacoma | 15.2 |
| Norfolk | 14.6 |
| Charleston | 14.3 |
| New York/New Jersey | 13.1 |
| Wilmington | 12.8 |
| Savannah | 12.8 |
| Baltimore | 12.2 |
| Houston | 12.2 |
| Miami | 11.9 |
| Philadelphia | 11.6 |
| Jacksonville | 11.6 |
| New Orleans | 10.7 |
| Portland | 10.7 |

Chart 8 – Important U.S ports working depths in meters at mean low water (MLW).¹⁷³

¹⁷² IMF – *World Economic Outlook Jan 09*,

<http://www.imf.org/external/pubs/ft/weo/2009/update/01/pdf/0109.pdf>, 2009-10-26

¹⁷³ ACP (2008), *The Panama Canal Expansion Program: An Innovative Approach to Infrastructure and Expansion of a Green Route*

<http://www.fasterfreightcleanerair.com/pdfs/Presentations/FFCAEC2008/Alberto%20Zubieta.pdf> 2009-09-01

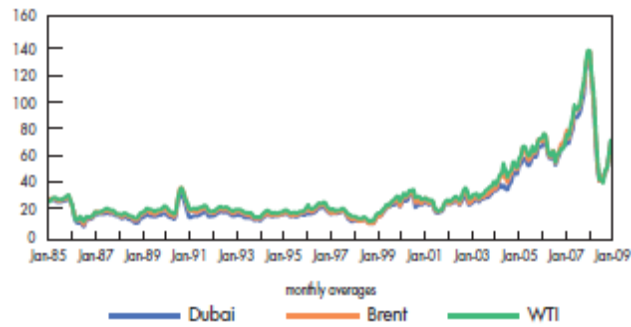


Chart 9 – Key crude oil spot prices in US dollars/barrel.¹⁷⁴

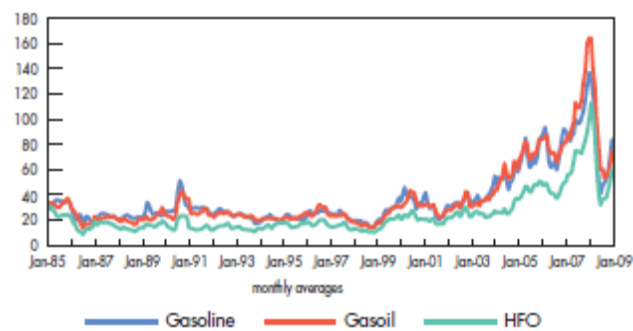


Chart 10 – Rotterdam oil product spot prices in US dollars/barrel.¹⁷⁵



Chart 11 – Last year crude oil spot prices in US dollars/barrel.¹⁷⁶

¹⁷⁴ IEA, *Energy Statistics 2009*, http://www.iea.org/textbase/nppdf/free/2009/key_stats_2009.pdf, 2009-09-24

¹⁷⁵ IEA, *Energy Statistics 2009*, http://www.iea.org/textbase/nppdf/free/2009/key_stats_2009.pdf 2009-09-24

¹⁷⁶ Crude Oil Price Forecast, <http://oil-price.net/>, 2009-09-24

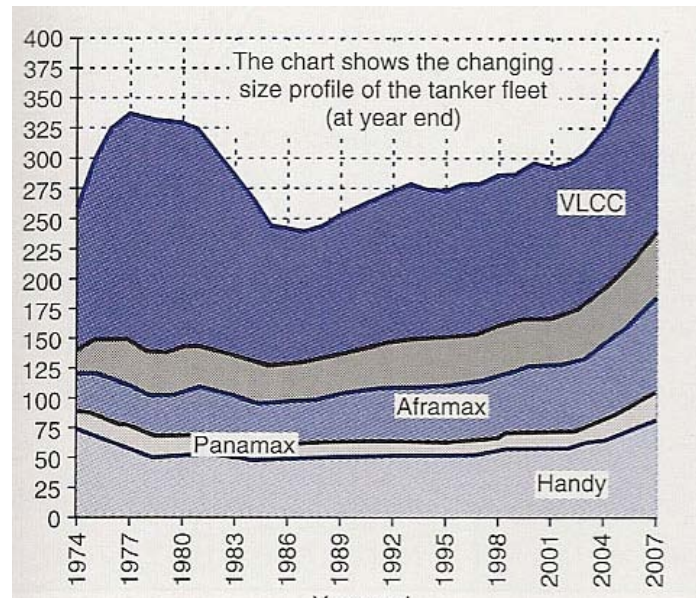
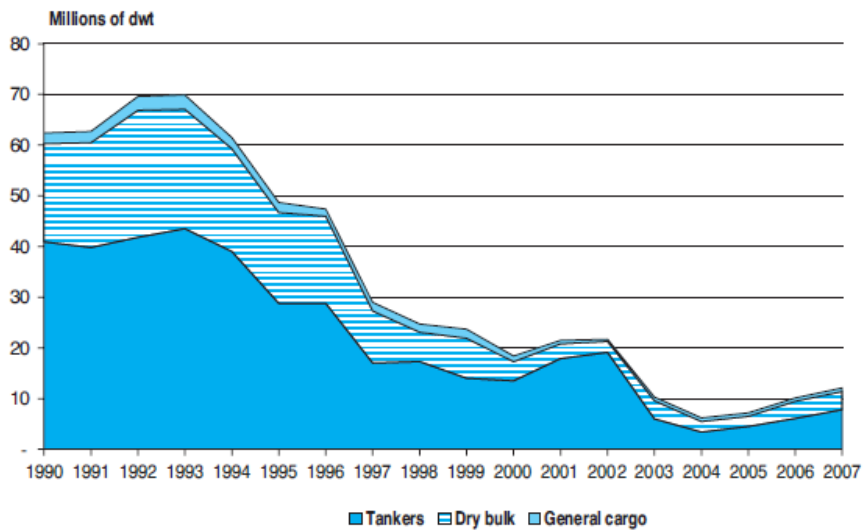


Chart 12 – The tanker fleet 1974-2007 (Million deadweight of tankers by size)¹⁷⁷

Trends in surplus capacity by main vessel types, selected years



Source: Compiled by the UNCTAD secretariat on the basis of data from *Lloyd's Shipping Economist*, various issues.

¹⁷⁷ Stopford, M. (2009) *Maritime Economics*, p. 429

Quick Answers Guide¹⁷⁸

How long is the Panama Canal?

The canal is 83 kilometres or 50 miles long.

How long does it take to transit the Canal?

On average, a vessel will take between 8 to 10 hours to transit.

What is the size of Gatun Lake?

It has an area of approximately 163.38 square miles and was formed when an earth dam was built across the Chagres River.

What is the length of Gaillard Cut?

It has a length of 13.7 kilometres across the Continental Divide and extends from Gatun Lake to Pedro Miguel Locks.

What was the cost of the original locomotives and what is their cost today?

The first locomotives cost 13,217 U.S. dollars and were built by General Electric. Today, the Japanese firm, Mitsubishi, builds them at a cost of approximately 2 million U.S. dollars each.

What are the dimensions of the locks?

Each lock is 110 feet wide by 1000 feet long. The amount of concrete used for all locks was 3,440,488 cubic meters.

What are the dimensions of the miter gates?

All miter gates are 65 feet wide and 7 feet thick. The heights vary from 47 to 82 feet depending on its position. The tallest are at Miraflores due to the extreme tides of the Pacific. Today there are 46 miter gates and their weight varies between 353.8 and 662.2 tons.

How long does it take to fill a lock chamber?

A lock chamber takes approximately eight (8) minutes to be filled.

How much water is required to fill a lock chamber?

Each lock chamber requires 101,000 cubic meters of water. An average of 52 million gallons of fresh water is used.

¹⁷⁸ ACP, *Canal FAQ*, <http://www.pancanal.com/eng/noticiero/canal-faqs/index.html>
2009-08-26

Where does the water that fills the lock chambers originate?

All water used in any lock chamber comes from Gatun Lake. This lake covers 163.38 square miles and was created when Madden Dam was built. At one time, Gatun Lake was the largest artificial lake in the world.

How high above sea level is a vessel raised?

Vessels are raised 26 m (85 feet) above sea level, the level of Gatun Lake.

What is the Canal tugboat fleet?

Tugboats are floating equipment that assists vessels during their transits especially at the entrances and exits of the locks and during their transit through Gaillard Cut, where a great manoeuvrability and power is required. With the purchase of tugboats Herrera and Los Santos the current fleet is comprised of 24 units.

What is the current toll paid for transiting the Canal?

The Panama Canal Authority has adopted a new pricing structure that is based on vessel type and tonnage. The increase in Panama Canal tolls was divided in two phases. The first phase, an average increase of approximately 8 %, was implemented on October 1, 2002; the second phase, consisting of an average increase of 4.5 %, will take effect in July 2003. In a further effort to address the specific needs of individual Canal customers, the ACP implemented a locomotive charge of 200.00 U.S. dollars per wire.

What is the lowest toll paid to date?

The lowest toll is 36 U.S. cents, paid by Richard Halliburton for swimming the Canal in 1928.

Which vessel made the fastest transit through the Panama Canal?

The fastest transit was made by the US Marine hydrofoil, Pegasus, which passed from Miraflores through Gatun Locks in two hours and 41 minutes in June 1979.

10 CANAL FACTS¹⁷⁹

- The canal has 9,000 employees and operates 24 hours a day, 365 days a year.
- 14,000 ships use the canal each year.
- More than 922,000 ships have used the canal since its opening in August 1914.
- A ship travelling from New York to San Francisco saves about 8,000 miles by using the Panama Canal.
- The first plans for a canal through Panama were made by the Spanish government in the 1500s.
- The canal runs northwest to southeast.
- Average ship crossing time is 8 to 10 hours.
- In 1939, the U.S. government began excavating channels for a new set of larger locks to accommodate big Navy ships and merchant vessels. The effort was halted in 1942 by World War II and abandoned. The 2007 excavation will closely follow the 1939 plan.
- The highest toll paid for a canal transit was an impatient tanker which paid 397,300 U.S. dollars for jumping the queue.
- The lowest toll was 36 U.S. cents in 1928 (3.84 U.S. dollars adjusted for inflation) and was paid by adventurer/author Richard Halliburton, who swam the canal.

¹⁷⁹ USA Today, http://www.usatoday.com/money/world/2006-06-18-panama-canal-usat_x.htm 2009-09-28

EXPANSION AT A GLANCE¹⁸⁰

Plan: To dig two new access channels and build larger locks connecting the Atlantic and Pacific oceans to Gatun Lake, which provides ship passage across Panama.

Cost: 5.3 billion U.S. dollars.

Financing: The canal authority says the project would be paid for by canal users with a graduated toll system.

Time: If Panama's citizens approve the expansion in a national referendum this fall, work would start in 2007. The canal authority hopes to have the new locks open in 2014, in time for the canal's centennial.

Existing locks: Will remain operational during construction of the new locks and will continue to be used after new locks are open.

¹⁸⁰ USA Today, http://www.usatoday.com/money/world/2006-06-18-panama-canal-usat_x.htm 2009-09-28