Programme Logistics & Transport Management

Master Thesis No 2001:26

Land Bridge

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As an Exponent of Inter-Modality in Trans-Ocean Shipping

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Abstract

The Baltic Sea and areas on its West Coast are once again bustling with economic activity and future potential, partly due to now being free from Soviet holds and partly due to being on the verge of entry into the EU. Lines of competition in the European port market are also being redrawn. Port of Göteborg, AB (POG) is envisioning a strategic shift by banking on this "sea of opportunities" for increasing its hinterland.

At present, unitised sea-borne cargo transport to and from Baltic States and Russian Region (BSRR) to destinations around the world passes through mainland European ports, mainly Hamburg and Bremerhaven. This is considered inefficient as compared to potential alternatives available. This study looks into one of those alternatives.

Inter-modality has introduced an element of efficiency into long distance cargo transportation through combined transport solutions. In this thesis the concept of combined transport has been applied to Trans-ocean shipping to scale advantages in transportation cost and time variables as compared to sea mode.

My thesis is that a Land Bridge between East and West Coast of Sweden for BSRR cargo using combined transport system and solutions is possible. For this ports' connectivity with respect to POG has been evaluated and transhipment activities and costs at terminals have been looked into. Both modes of land transportation have also been explored to judge for suitability as part of a combined transport system.

Key words: Combined Transport, Inter-modality, Connectivity, Transport Chain, Transhipment, Terminal Costs, Shipping and Trans-Ocean Shipping

Acknowledgments

In the first place I will like to thank my professor and also the supervisor of this study, Professor Arne Jensen, for his enduring patience with the group as a whole. I will also like to pat my shoulder that considering my individual circumstances, I managed a balancing act to a fairly satisfactory degree by my own standards.

After that my thanks go to all whom I interacted with for the completion of this project. Among them stands out Mr. Micael Thunborg of RailCombi, Mr. Bengt Melin of Karlshamn and Dennis Crantz of Skoglund Transport Systems. Finally, my gratitude goes to Eva Gustavsson of GRI at School of Economics and Commercial Law, Göteborgs University who helped me in giving some final touches to the look of this document on the submisson day.

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1 THE PROJECT AND RESEARCH PROPOSAL

1.1 GENERAL INTRODUCTION

This project is based on an idea for new business and is about creating a new segment of service for the Port of Göteborg, AB (POG). This segment is not only intended to add to the existing portfolio of services but also fringes upon strategic repositioning of the company using the available resources and capacity.

The idea per se is about exploring the possibility of making the POG a major transit port in the European port market, especially by exploiting the current sea-borne cargo flows and developing economic potential in Baltic Sea and Russian Region (BSRR). This aspect is explained later on in this chapter in more details.

The sheer magnitude of this idea as a basis for thesis project work had some obvious demands in terms of management of research work and application of theoretical knowledge. A group of four students was assigned to the project. During the very initial phase of preparing a research proposal, the group divided the work into small and more manageable units. Quest for better project management, solution to communication problems regarding the project work and to have crystal clear areas of responsibility contributed to the decision. The details of this approach are presented in a section about Project Structure.

1.2 LAY-OUT OF THE REPORT

The report about this subproject has been arranged into short chapters and every chapter starts with a brief introduction of the subject matter discussed in the ensuing pages. The report has ten

chapters in total. Chapter one introduces the reader to the general project and the layout of this thesis report. It also details the research proposal for the whole project. It is followed by background, problem investigation, purpose, and scope and limitations of Land Bridge study in next chapter.

In the third chapter, research design and methodology issues are the subject matter. Appropriate research designs have been discussed along with methods of information gathering in view of specific research questions for this subproject. Chapter four discusses the theoretical relevance and necessary referral and conceptual framework for this study. In next chapter, starts the actual research work with a survey of possible locations for Land Bridge's eastern connections. The targeted area for available facilities is surveyed here and criteria are developed and set for the selection process followed by comparative evaluation of main contenders.

Focus of examination in the chapter six are port terminals, cargo handling activities and their cost aspects. After this I have tried to investigate the both land modes of transportation. Road transportation is the topic of chapter seven while chapter eight deals with Rail mode. Chapter nine discusses the findings while trying to analyse the economic and functional viability of the Land Bridge and other cost and service aspects. The report ends with some answers to research questions and conclusions in chapter ten and a list of references.

In the rest of this chapter, a Research Proposal for the entire project is presented that is the result of a combined effort by the group guided by our supervisor, Professor Arne Jensen. The group consists of Nasir Rana, Claes Kristenson, Marina Erlandsson and Olusina Coker. The proposal starts with an introduction in the next section and most of its wording has been done by this author.

1.3 INTRODUCTION

This proposal outlines a research project for Port of Göteborg AB that is aimed at exploring a business opportunity. The results of the investigation will provide input for informed decision

making by the port authority. Due to unusually large size of the project, three inter-related yet independent theses are envisaged out of it. Each thesis constitutes an alternative or subproject within the umbrella project. It also means that this Research Proposal is common for all the subprojects and will form the introductory chapter to each of three papers.

First, we give a brief background description. Then we will present our principal, the Port of Göteborg AB. A section about the geographical region of interest, i.e. the Baltic States and Russia Region will follow this. The rest of this proposal details the project structure and how the results from subprojects will be integrated.

1.4 BACKGROUND

During our studies on the Masters Programme at the School of Economics and Commercial Law at Göteborg University, we made a visit to the Port of Göteborg, AB. Leaving the facilities we were fascinated by their operations. What was especially interesting was the pace and magnitude of their development in the face of stiff competition from the Nordic and European mainland ports. Even though the four of us that are undertaking this joint effort did not plan to work together at that point, all of us saw Port of Göteborg AB as an interesting company that we very much could foresee as a study probject for our forthcoming Master theses.

When our professor presented us with a subject for a thesis with Port of Göteborg AB as the principal and sponser, all of us saw this an opportunity to work on an interesting case. The main idea for a research topic was to study the freight flow to and from the Baltic States and Russian Region. This is also interesting from a futuristic view as the imminent entry of the three Baltic States into EU will provide a new impetus to the economies of, and will present fascinating opportunities for businesses in, the region.

Recent impetus for growth in the Baltic States, especially the added impact of liberalisation and deregulation policies after gaining independence from Russia, has given rise to sea borne

trade and they are increasingly looking westwards. This is all but understandable. Economic and cultural links spanning over centuries of shared history further Sweden's natural interest into these states, besides a yearning to become a major regional player.

All these factors combined present a considerable challenge for the actors involved in the port and shipping business to look at the situation from new angles and perspectives.

1.5 THE PRINCIPAL - PORT OF GÖTEBORG

Here in this section we shall present our principal, the Port of Göteborg AB[1]. The information in this and subsequent section is an effort to provide a perspective on the research project at hand.

POG is the largest trans-oceanic port in Scandinavia. The City of Göteborg owns the port. One third of sea borne goods in Sweden passes through it and it controls 60% of Swedish container cargo. It is the largest port in Scandinavia with regular traffic to destinations around the world. Its personnel strength is around 1,200 people who are directly on its pay roll while other port connected work force consists of about 10,000 people. Further, some 200,000 people are connected to it through imports and exports activities. The port is centrally located within the Scandinavian region, serving 70% of Nordic Industrial capacity and half the population of the region are located within 500 Km radius. This only serves to indicate the degree of economic dependency of the region on it and its potential and scope.

A brief operational overview looks like this. In year 2000, the Port handled 33 million tonnes of goods, of which 13.5 million was general cargo (95% of which are unit loads), and 685,000 TEUs of containerised cargo. It also handled 417, 000 trailers (of over 14 meter) and other Ro/Ro units, 310,000 new cars and 2.9 million passengers in the same period. It has a total quay length

[1] The following part is based on information from the *Annual Report of the Port of Göteborg for 2000*.

of 12 Km and 4.5 million meters square land for cargo management and handling activities.

The Port of Göteborg has direct sailings of 6 daily departures to continental Europe, 8 daily departures to the Scandinavian region, 3 weekly departures to North America, 4 weekly departures to Asia, 2 daily departures to Great Britain and 1 weekly departure each to Latin America, Australia and New Zealand. It has planned to double its capacity by year 2005.

The Port of Göteborg has as its business concept to load and discharge cargo and develop customer-oriented transport solutions that will route cargo through its facilities. In the next 10 years, the Port has as its vision, to achieve following objectives:

- Cargo turnover of 1.5 million TEUs and 700,000trailers
- Continued strengthening of the competitiveness of the Scandinavian Industry
- Development of new terminal areas
- Safer navigable channels
- A new unit-load rail terminal
- Improvement of infrastructure
- More direct sailings to overseas markets
- More rational and environmentally responsible transport solutions

To attain these goals, and strengthen its position as Scandinavia's central port, the Port of Göteborg plans to work in several direct calls of trans-oceanic shipping lines through constant contact with shipping companies. This vision also calls for some demand management of cargo supply. In this picture, the BSRR comes as a natural source and ally.

1.6 THE BALTIC STATES AND RUSSIAN REGION (BSRR)

"The BSRR has the potential to become one of Europe's strongest and most dynamic growth regions. After a few years of initial difficulties and adjustment problems following independence, the eastern area of the region, with the new Baltic States and Poland, has displayed favourable economic expansion, with sharply rising growth rates and an expansion in trade that outperform the more mature EU countries in the region. The major question has been – and still is – the direction of developments in Russia."[2]

As an interesting development area for the coming 10-15 years period, the Baltic Sea Region is very highly regarded. It is so, owing to the following factors[3]:

- The region has a big population with growing economy
- The ascending purchasing power within certain population's segments of Baltic countries and Russia gives rise to increase import of consumer goods and establishing of departmental stores by big international chains, such as Swedish IKEA has done recently in Moscow.
- The region has a unique potential for the structural transforming.
- The volume of trade is growing fast.
- The growth rate of national economies in the region especially in Baltic States is positive and stable. Future projections are also good.
- The investments in share capital, loan and reinvestment of profits are increasing.
- The region has a good transport infrastructure.

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[2] *Action Plan For Maritime Transport In The Baltic Sea Region – Follow-up Report* by By Swedish Maritime Administration March, 2001

[3] For complete reference please see Kristenson, & Erlandsson, 2002

- Requirement for improved integration is increasing simultaneously with business growth between East and West.

Analysis of cargo flows in the Baltic Sea ports has also showed a steady increase in total yearly value and an almost steady yearly increase for each succeeding year in each port. In total, freight cargo within the Baltic Sea ports has witnessed a persistent rise in volume. This is an evidence of the increasing importance of the Baltic region, both in the diversified range of products and volume of exports. Thus, there are reasons for increasing confidence in the economy of these states by the international business community and an indication of growth in domestic economic activities.[4]

1.7 AIM OF THE STUDY

Driven by profit motive, every commercial concern is sensitive to threats to its position and endeavours to further strengthen it. The Port of Göteborg AB is no exception.

This study will examine the cargo flows through the Baltic Sea Region (BSR), especially to and from the Baltic States and Russian Region (BSRR)[5] and identify those flows that can be of commercial interest to the Port of Göteborg. This interest stems from its vision to retain its dominant position in Scandinavia and to become a major player to be reckoned with in the mainland European port market. This study, therefore, is aimed at exploring the opportunity for Port of Göteborg of becoming the main or at least a major transit port for cargo originating from and destined to BSRR.

1.8 LIMITATIONS

As regards the scope of this study, some general limitations regarding cargo type pertaining to the whole project seem in order here. We will not look at goods flow that the Port of Göteborg AB cannot handle or intends not to handle in the

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[4] Ibid
[5] Please note that we are talking about two different terms and respective regions.

future (e.g. bulk, oil, etc). Neither will we look at the cruise nor ferry traffic since it does not interest the Port of Göteborg AB in the same way as the other goods flows do. Further, we shall be concerned only with cargo originating from and destined to BSRR while passing or which has the possibility to pass through Port of Göteborg.

1.9 PROJECT STRUCTURE

Since we are dealing with such a large project, we have chosen to split the work into more manageable entities that will fit the structure of the sub-problems that can be derived from the main problem. Each sub-problem will be dealt with as a separate project and an independent thesis, but this research proposal will form a general and common introduction to all. After discussions with all the people involved in this project, the following structure emerges in the form of three separate study projects:

1.9.1 Analysis of Present Situation

The first part shall take into consideration the present situation for cargo flows from the BSRR to continental and world destinations and vice versa and what the future development could be like. This part is presented in Coker (2002).

1.9.2 Modelling of Sea-Links

Kristenson and Erlandsson (2002) have worked on this subproject and it examines possible sea-links for unitised cargo flows from the BSRR to continental and world destinations and vice versa. This is the second subproject of this series and also deals with cost comparisons.

1.9.3 Land Bridge Study

The third part presented in this thesis shall deal with the alternative of a combined sea-link and a Land Bridge through Sweden as a way of getting cargo to the Port of Göteborg to and from the BSRR. Cost and service variables associated with the alternative will also be examined.

Precise definitions of research questions along with other details like research design and theoretical framework for a particular subproject will be done in individual study about that subproject. However, the second and third subprojects have an important link between them when it comes to agreeing on which port(s) on the Swedish East Coast that should be used for discharging and reloading of the goods. This selection will have to be done at a fairly early stage since the future work is dependent on this

1.10 INTEGRATION OF RESULTS AND CONCLUSIONS

The output from each subproject will be dependent on other part(s) to draw conclusion and present a solution for the focus of this joint effort. Regarding the subprojects that will perform cost calculations and service evaluations of different routes (subproject 2 and 3), there is an inherent necessity to use common cost/service units in order to get an output that is relevant for the main project.

The cost units that will be used are cost per load-carrier unit (trailer or TEU). To obtain these results, the costs of a round trip of each chosen route will be added up and then divided by the number of units, which is determined by the degree of utilisation on each vessel. For the sea-link calculations we will use three different sizes of vessels that could be representative for different size of shipping companies in order to get a clear picture how economies of scale could influence the results of our simulations.

For the Land Bridge alternative, intention is to find cost per load-carrier unit for both road and rail mode. Each cost figure will consist of three major cost components. Terminal handling costs both at the east and west coasts which shall be common to both modes and transportation cost of each mode. Inter-competition between these modes will give an optimal cost figure based on preferred and defined cost-service variables. This cost figure will be added to the relevant sea-link cost to make it comparable to other alternatives consisting of whole sea-link(s)

and to provide a meaningful interpretation to the output from this study.

2 LAND BRIDGE: AS AN ALTERNATIVE

As mentioned and discussed in the research proposal in chapter one, the report in these pages will deal with the third alternative as a subproject that constitutes a thesis in its own right. This chapter, therefore, deals with the entire subject on micro- or subproject level. Here same academic treatment shall be provided to the focus of third alternative, as has been done in the case of complete project in the first chapter.

2.1BACKGROUND

The immediate background of this subproject is division of labour, proper utilisation of the group resources assigned to the overall project and focus of clear responsibility. But going beyond this, we realise that idea of BSRR cargo, especially outbound passing through Sweden has long been broached and mooted upon. But it could not materialise due to one or other reason. Now POG feels that time has just become ripe, especially due to growing economic activity in, and importance of, this region and its own business reasons, to explore the option how this idea could be put to the test of practice.

2.2 PROBLEM

In simple words, it is to find the viable, competitive and advantageous, in terms of cost and service, alternative transport mode to the existing or potential sea-link(s) for unitised cargo flow between east and west coasts of Sweden back and forth. We have a fixed location on the West Coast while on the East or rather Southeast Coast choice is open.

The viability here implies availability of infrastructure for such a service, which means means of transfer between modes, and of connecting links between points of transportation. It also means current provision or future potential of service per se. Competitiveness implies comparative evaluation of both rail and road modes considering one way cost per cargo carrying unit and service time. Lastly, advantage in terms of cost and service must be analysed in the larger context of other alternatives.

Why this situation constitutes a problem and needs a solution is discussed in the next section that attempts to define the purpose of this study.

2.3 PURPOSE

The specific purpose to undertake this study as a separate subproject is that when it is completed it will provide us with results/findings on cost and service variables that will be used in conjunction with the similar results for the part sea-link for this alternative. Combined figures for cost and service variables for this alternative will be compared with the similar figures for the two other alternatives as defined in the research proposal.

2.4 SCOPE AND LIMITATIONS

Here a statement about the scope and limitations of this study seems in order. First and foremost in this regard as far as its results are concerned, this study is situation- and subject-specific. So it has a narrow scope in terms of its general applicability. Although the description of operational characteristics and discussion about cost and service variables in three functional areas dealt with herein is as valid as it could possibly be within the boundaries of its research design.

Applied thesis research is unique in the sense that student feels sandwiched and, sometimes, torn apart between opposing expectations. He has to satisfy academic standards of research and still be able to present a satisfactory and applicable solution to the problem of the principal who has commissioned the research. And these often do not coincide. This factor also limits the general scope of any such study.

Thesis writing is a time-bound mandatory exercise. Time duration allowed for the completion of the exercise, as we all know, is definite. It is considered a significant constraint on the activity, especially considering the difficulties in obtaining interview appointments.

All the executives who were considered important sources of primary information and, thus, possible respondents, were in all fairness extremely busy people with frequent foreign and out-station travel obligations and other requirements. This proved to be a critical element in the process of obtaining required information. Sometimes, a person at a preferred/required level of decision-making authority was not available at all and one had to settle for a person of second best choice.

Another limitation could be the absence of any sound (or should I say 'research-based') hypothesis regarding actual customers' (in this case cargo shippers) demands or preferences about service and cost variables. Though we did get some briefing about shippers perspective in our meetings with the port authority (on 10th of Sept., 2001 at port head office) but, at best, it is only an assumptions and still constitutes a limitation.

From an individual researcher's perspective who has a non-Swedish lingual and cultural background, working in Swedish environment where everything is closely tied with local language, was another important limitation. It *might* have affected the *quality of research,* though not the findings and results of this study. But then my professor and all the other persons whom I interacted with were extra conscious of this fact and they all tried their best to facilitate this research work. But still I personally feel, citeris paribus, a native Swede might have done a better job.

2.5 RESEARCH PROCESS FLOW

In this section I shall try to construct a word-picture of the whole process followed to complete this study. My thesis in these pages deals with operational, service and cost aspects of a Land Bridge as defined in the problem statement. A research design construction will be done as suitable to the nature and requirements of the problem statement.

From the problem statement flows specific research questions which will determine the nature of research approach or methodology. This methodology will advise and guide to methods of data collection and sources of information. Finally, some words will be said about the credibility of the approach by evaluating the validity and reliability of the research on this subproject.

This information and data will be processed in discussion and analysis style to draw inferences and conclusions. Final and overall viability will be evaluated in the context of the main project.

3 RESEARCH DESIGN AND METHODOLOGY

When starting to write this chapter, I was struck and overawed by a battery of similar and interchangeably used terminology. Words like design, structure and methodology; method, strategy and approach are being used in the theoretical literature on the subject without giving it much thought. A lot of semantics, really!

This chapter, however, tries to document the validity procedure adopted to conduct research on this subproject. I have tried to follow the established norms and rules using some of the terminology riled upon above but at the same time trying to avoid the confusion it creates, as I had no alternative. I start with a discussion about the nature of the problem and appropriate research design. Following that various approaches to research methodology in the light of the research theory will be explored. Then I shall try to examine the appropriate investigation methods in relation to their relative relevance to find a solution.

3.1SPECIFIC RESEARCH QUESTIONS

The starting point of the umbrella project is: under what conditions or circumstances can POG become a transit port? Among the prerequisites, it was found that an efficiently functioning Land Bridge could be one of the possibilities, which precisely is problem statement for this study. Investigation of this statement poses some questions that will be taken up during the research activity. These questions are listed below:

- Which are the possible/potential locations on the East Coast of Sweden to serve as Eastern end of the Bridge and some of the criteria to evaluate their attractiveness?

- What service and cost variable will make this alternative competitive and effective vis-à-vis the main problem?
- What service infrastructures are currently available to help support the functioning of the proposed Land Bridge for both land modes of transportation and what level of service, if any, can it support?
- What are the potential costs and service throughput times for each link on each mode and which land transportation mode is more competitive?

3.2 RESEARCH DESIGN

Research design or methodology refers to the procedural framework within which the research is conducted. It describes an approach to a problem that can be put into practice in a research program or process, which could be formally defined as an operational framework within which the facts are placed, so that their meaning may be seen more clearly. In other words the method is a tool used to retrieve new knowledge. The results produced by the use of this tool are as good as its appropriateness for, and application to the situation. Theoretical discussion in the following paragraphs is largely based on the topics, proceeding and notes of the seminar conducted by Professor Arne Jensen of Göteborgs University at Handelshögskolan, Göteborg on 17th of May, 2001.

3.2.1Exploratory Research Design

Subjects or topics to be researched under this design are characterised by, in the opinion of Professor Jensen, "almost absence of any prior knowledge or very little knowledge". Some of the purposes to be achieved by using an exploratory research design are:

- Formulating a problem for more precise investigation
- Establishing alternatives and priorities for further research

- Developing hypotheses for pure research. It may be a problem per se. Here the aim is to diffuse or un-structure the problem
- Gathering information about the practical problems of carrying out research on particular conjectural statements
- Increasing the analyst's familiarity with the problem
- Clarifying the concepts, etc.

3.2.1.1 Research Methods for Exploratory Design

They are rather informal and unstructured and include literature research, key informant surveys, focus groups and analysis of selected cases. Literature research is important and should always be done to buttress and expose the theoretical aspects of the problem. Key informant surveys should focus the experience in the field and expert interviews. Here one should always aim at reaching to or looking at the original source of data.

Regarding focus groups, care must be taken with regard to pressure groups or vested interests. Also, they should be homogeneous with regard to the question being investigated. Case studies analyses provide opportunities for and facilitate simulation and evaluation of results.

3.2.2 Descriptive Research Design

This design calls for well-defined variables and standardised measuring instruments. The principal aim of this design is to describe the characteristics of a set of objects, e.g. companies, consumers, etc. It requires exact quantitative descriptions.

3.2.2.1 Research Methods for Descriptive Design

There are mainly two types: cross-sectional studies and longitudinal studies. The former deals with investigations at a given point in time or one period. It is like a one-shot study of a large probability sample. The latter follows the same variables over time, like time series analysis. The selection of a particular method between these depends upon the range of variation among the variables.

3.2.3 Research Design for This Study

In this subproject most of the research will be done with an exploratory approach since the problem exists in the real world and it requires an applicable solution. This description adequately satisfies requirements for, and matches with, at least one if not more, of the purposes of the exploratory research design described above.

This nature of the problem also enforces certain limitations on the research process because the problem is well defined and exact in nature and offer little or no freedom in terms of adjustments and changes in it. However, it is only natural to expect that my confidence and approach in tackling it will hopefully grow as I gain in insight and knowledge while working on it.

Parallel with exploratory research, a descriptive design shall also be used partly. This will be done to do process mapping of the phenomenon that is being researched and the processes it entails. This will also be documented through mapping analysis. The method being applied in present study is that of a cross sectional study, as an existing reality will be scrutinised at this period in history

3.3 INFORMATION AND DATA COLLECTION

Collecting data and information and processing the data into information can be done in two ways, either by the quantitative or by the qualitative method. Through the former, the data are collected in numbers from which statistical calculations and inferences can be drawn. This method is mostly used when working with and researching large populations.

The qualitative method on the other hand deals with observations, interpretation of inferences in their specific contextual backgrounds, focusing variables and relationship matrices amongst them. This is often resorted to due to lack of classification and quantification about them. The purpose with

this approach seems to be to advance to a more profound degree of knowledge.

The treatment in this thesis is more of a qualitative nature. In these pages, I am going to explore, document and interpret the reality that already exists. My job here will be that of a searcher who ferrets out the requisite components and pieces of information/ knowledge to get to the desired or rather required solution with a professional objectivity.

On the opinion side, especially regarding the service variables, it is hard to quantify the subjective image of the interviewees. Hence, a natural tilt or bias toward the qualitative approach. Further in doing this exercise, I tried to be flexible to the situation at hand and to the interviewees, never letting the aim of this study elude me which also implied that I was searching for more qualitative information.

I have consciously tried to discount the chosen persons' subjective image of the situation/ idea that I was interested in. They were fully briefed in advance that they are being interviewed, as industry experts who, based on their own experience, will contribute to the creation of knowledge rather than the stakeholders or future interested parties in the project.

3.3.1 Collection Methods

There are numerous approaches to gathering data needed for the examination of a particular problem. The most common distinction is primary data, collected through direct and first hand examination, and secondary data that include earlier examinations, existing statistics, literature and articles. It's never possible in any research endeavour to solely rely on one type and discard the other source. My reliance on both is, therefore, inevitable.

3.3.2 Secondary Sources

In order to establish the specific research questions beyond the broad assemblage of problem statement, I started by collecting the secondary data. Although secondary data and info exist, especially regarding costs and links, but it is not in readily useable

format. Thus, it needs to be connected and processed for meaningful interpretations. Secondary information used here consisted of brochures, info leaflets, annual reports, company documents and other published records. The understanding and knowledge gained from it greatly helped in shaping the primary information needs.

3.3.3 Primary Sources

The primary data and information were mainly acquired by conducting personal and telephone interviews, e-mails and site visits. When working with interviews as information gathering method, three aspects were considered more important than the rest. Selection/availability of the interviewees, standardisation of the interview process across them which also means the control over design and order of the questions asked, and limitations and context of their responses. These interviews were more on the qualitative side and characterised by the researcher and respondent having a discussion where the researcher controls the topic discussed but respondents also have the opportunity and freedom to shape their responses and influence the direction.

3.3.4 How Interviews Were Conducted?

In my interviews, I used an interview guide (**Appendix-1**) covering all the relevant aspect of the problem under investigation and to keep the discussion focused. As can be seen from this guide, it gives a lot of latitude to the respondents to contribute freely, prioritise and advise generally.

To be able to collect as many and as detailed answers as possible, I tried to motivate and prepare my respondents. This is done by explaining the purpose of the study and by sending them some information in advance. It was further explained that I may or may not present the individual respondent's exact answers and in some instances only present my interpretation of the answers and other material received. It was also clarified that, if necessary, they will be quoted in their personal capacity for a particular opinion or information.

At the actual interviews, I avoided leading questions at the beginning and started off with rather general questions to set the tone of the interview. During the interviews I took notes of important and new information. To cross-check the veracity of information and clarity of opinion and ideas, relevant part of the thesis report was sent to them for perusal and removal of possible inaccuracies. I believe this help removed any misunderstanding, misinterpretation and has enhanced the validity and reliability of this exercise and report.

3.4 RESEARCH EVALUATION

Credibility is important to all types of research. The issue of credibility refers to being able to demonstrate that the research was designed in a manner that accurately identifies and describes the phenomenon to be investigated (Ryan et al, 1992). In order to reach credibility in a qualitative study, issues concerning validity and reliability should be described. It is difficult in this type of study to reach a commonly agreed "truth", but a main concern is to present the research so that it could be perceived as credible to the reader (Gill & Johnson, 1997)

In this study I have tried to reach credibility by, as openly as possible and stating clearly at the start of this chapter, showing how I pursued this research and revealing and listing all the sources I have used. Further, I give an account of my opinion of the validity this research and reliability below.

3.4.1Validity

Validity refers to the accuracy of measurement process and to the extent to which a scale encoded in a set of questions actually measures the variables it is supposed to measure (Gill & Johnson, 1997).

Validity of research in this thesis will be affected by how sensitive and alert I have been to the design and procedure of this project. Further, it will be affected by the effectiveness in formulating information demands and collecting evidence to satisfy them. In other words, it was important to be thorough when defining interview topics, questions and its purpose.

Quality of the researcher's relationship with the respondents is directly proportional to the degree whereby they willingly contribute in the research endeavour and offer the best evidence and support. A sure and safe way to elicit all the possible commitment in this regard was the fact that all the respondents are from the companies who will be the major actors and stakeholders in future implementation of this project.

Disclosure of sources and documentation of the whole procedure, particularly in this chapter, have also enhanced the validity of the report and facilitation of opinion formation and ability to question the quality of the argument by the reader.

In empirical studies, it is essential that measurements are reliable, which presupposes that the measuring instruments used are of good validity. By the validity of a measuring instrument or tool is generally meant that instrument measure what it is intended to measure and that no systematic errors occur.

In empirical studies, the validity of measurement can be promoted by a number of principles. The most important is that good scientific methods are used when planning and carrying out the measurement.

.....Another principle involves comparing the results of the own measurement with other independent measurements of the same concept. (Jensen, 1990)

This principle will also be used to enhance the validity of this study.

3.4.2 Reliability

(Reliability of a research exercise) refers to its consistency; that is, the extent to which a measurement device will produce the same results when applied more than once to the same person (or situation) under similar conditions. The most straightforward way of testing reliability is to replicate (Gill & Johnson, 1997).

"The reliability of the results of a transport system study can be expected to be greatly dependent on the choice of method. ..... the method side of the transport system research cannot be said to be particularly well developed." (Jensen, 1990)

Thus, reliability is one feature and another name for interpretation of reality consistently and constantly. And reality is a relative phenomenon that means it will always need a contextual frame of reference for its most accurate description and contextual variables have a tendency to evolute over time. But that is about the qualitative aspect of the study, and inferences and interpretations drawn in it.

Opinion audit and review by the respondents were aimed at enhancing the reliability from qualitative aspects. Still a lot of information in this project relates to physical things and geographical mapping which is easily verifiable. This goes to propose that the quantitative side of this study hahas a very high degree of reliability. With a high reliability, the study has a low frequency of random errors and its results can be replicated within a fair time perspective.

4 THEORETICAL FRAMEWORK

The entire project this group is working on is situation specific and of applied nature to a predominant degree, thus, cannot be generalised to fit or stretched to bring into the ambit of a particular theory which may be wholly applicable to it.

More than one perspective shall be taken when analysing the fitness of this alternative within the broader scheme of things. But system theory shall be predominantly used to this effect. The approach and treatment of the information and discussion in this chapter is to view the Land Bridge as a system by delving into its components. Along the way, applicable theoretical concepts and information have been meshed to develop a possible framework for understanding.

Theoretical description of transport systems is considered incomplete if requirements for quality of proposed service are not taken into account. The theoretical framework, therefore, ends with determing of service quality variables required of a Land Bridge. But before starting discussion on Land Bridge as a system to develop an internal perspective for this study, it seems necessary and beneficial to explore the external and broader perspective as well. The broader perspective relates to the whole project that includes sea links also. The concept of combined transport can help us here.

4.1CONCEPT OF COMBINED TRANSPORT

By combined transport, according to Jensen (1990), is generally meant transportation of goods between origin and destination points, and when the transportation satisfies the following conditions:

- *The goods are loaded on a load carrier at the point of origin and hauled on the carrier to the destination point where they are unloaded;*

- *The carrier is transferred at least once from one mode of transport to another between the points of origin and destination*[6].

The central factor in combined transport is the use of interchangeable load carriers. Instead of handling goods between the different modes of transportation, load carriers are handled. Normally the carrier is standardised. (Jensen, 1990)

Both mobile and non-mobile carriers are used. The concept of mobile carrier and transport vehicle sometimes coincides in a given definition of combined transport. A truck, for example, can over a certain section of the transport route function both as a means of transport and as a carrier, while on the other part of the route functions as only a load carrier (Jensen, 1990). This exactly is the case in this project where combination of trailer-boat-trailer-rail-trailer in ferry or feeder vessel traffic and during land transit will be studied.

Jensen (1990) has also developed and modified the concepts of combi-traffic in Swedish environment to a great extent. I believe these concepts with certain modification are applicable to the combined transport system in general. Or a transport system involving any two or more modes of transportation as the essence of inter-modality is transhipment between two different modes. According to him,

"During the 60s and 70s combi traffic has increased and is now in use to a larger or lesser extent in most of the countries in Western Europe and North America. The driving force in European development has to a certain extent been the need of transportation containers to and from the ports and the traffic-political ambitions in certain countries to reduce road traffic. In the USA, however, the driving forces were different. It was developed .....primarily for commercial reasons".[7]

4.2 LAND BRIDGE DEFINED

This thesis mainly examines the future possibility of unitised cargo to and from BSRR passing through Sweden over the land only as part of the larger flow which also involves prior other possible modal-links. The flow is also origin/destination specific in the context of this project. Due to this land

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[6] Jensen, Arne, 1990, *Combined Transport – Systems, Economics and Strategies*, pp 4 f

transit/transhipment nature, this link has become to be called as Land Bridge by people working on it. Therefore, it seems, appropriate to examine the fitness, and specify or limit the use, of this term here.

The term Land Bridge is not particularly used in European literature on logistics and transportation. It seems to be of a North American origin as reference to this term was made in one of the courses in this program while discussing logistics technology from an American perspective.

For the transport of sea-borne cargo to and from the BSRR over the land link from the East to the West Coast of Sweden and vice versa, therefore, it will be appropriate to use the term of Land Bridge. In the context of this project, however, it will be used to mean and express ***the transportation of sea-borne cargo over a land-link that constitutes only a fraction within the entire transport chain, whereby that cargo flows from origin to destination.***

Sea-borne in the above definition implies cargo nature, mode of transportation and long haul over sea. The entire transportation or cargo flow route predominantly consists of sea travelling, and land travelling comes into picture out of necessity only. The necessity is forced by comparative cost and service advantages.

4.3 LAND BRIDGE AS A SYSTEM

In this section management system and transport network system theories will be relied upon to develop an understanding of Land Bridge as a system and its inputs, functions and output. Taking this combined perspective will divide the complete system into components or subsystems

Viewed from a management theory system perspective, it is easily noticeable that Land Bridge in this case will have three subsystems. As two of these subsystems will be identical, therefore, from a functionality point of view it has essentially two subsystems. These subsystems are:

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[7] Ibid.

- Trans-shipment of load carriers between modes at terminals
- Haulage over the distance or link.

The latter will have two mode-dependent variations. But in reality only the most efficient and competitive mode will be the part of final functioning system. Satisfactory output from both subsystems will be necessary for a functional Land Bridge system.

The second theory, i.e. transport networks system theory views the system consisting of nodes and links. When a transportation system is modelled as a network, the nodes play a crucial role. A node can be anything from a single machine to a whole country. It is in the nodes that handling of cargo is done. In the links cargo is moved from one node to another node where cargo is again handled in some way. The handling in nodes ranges from re-routing the cargo carried by a vehicle along a new link to reloading the cargo onto new vehicles or storing the cargo (Jansen, 2001).

If the above perspective were taken then using its terminology and depending upon our choice of number of locations on the east coast, it will consist of three nodes and two links, and the links constituting two separate routes. Combining both the theories creates an interesting perspective, and a variation defines our view that each component or subsystem will consist of a link and two nodes. Two of these subsystems, i.e. operations at nodes are identical. In management theory functionality is the basis of a component or subsystem while it is the link or route which integrates the system in the second theory.

4.4 SYSTEM COMPONENTS

In the project under study, a combined transport system will consist of following physical components:

- Ferry or feeder vessel
- Load carriers

- Railway carriage trucks
- Discharging and (Re)loading system

Each of all these components if treated as a subsystem have further components but I limit the sketching and description of the complete system here. In sections below, main characteristics of these components are discussed.

4.4.1Ferries and Vessel

This is the main subject matter of second project of this series. For details in this regard, please see the thesis about Modelling Sea-links (Kristenson & Erlandsson, 2002).

4.4.2 Load Carrying Units

Jensen (1990) has defined various types of load carriers in his study about Combined Transport in great lengths. These load carriers take the form of trucks/trailers, semi-trailers, detachable platforms, swap bodies optimised box-type mini-platforms or mini-containers used in C-Sam system. He discusses these load carriers as a basis of various techniques of combined transport especially involving specific load carriers and railway wagons. One such technique uses

"Semi-trailers or trailers with removable dollies which are transported on rail cares over a section of total transport distance. In this context, trailer with removable dolly function in the same manner as a semi-trailer. The load-carrier in this case moved to the railway truck either by vertical handling, or by horizontal handling.

In vertical handling, the carrier is moved to the railway car either by straddle carrier or by a heavy fork-lift truck equipped with gripping arms[8]*".*

Another technique deals with swap-body system. According to Jensen[9],

"By a swap-body system is meant a form of combined transport in which a carrier consists of a standardised swap-body which can be handled vertically to move it from the road vehicle to the train.

The load carrier in the system is a truck platform which can be detached from the vehicle. The swap body is equipped with four drop-down legs, one at each corner and a special

[8] Ibid
[9] Ibid.

lifting device or with air suspension, which enables it to be lifted and lowered. When the swap body is to be detached from the vehicle, the platform is lifted sufficiently for the vehicle to move freely underneath leaving the swap body standing on its support legs. The pick up is carried through in the reverse manner. They are also equipped with bottom corner fitting according to container standards (ISO).

The swap body load carrier makes it possible to drop off the body at the receiving and originating points, as well as rail or truck terminals, without the use of any other equipment than the actual swap body vehicle.

At the rail terminal, the swap body is switched to and from the railway trucks by vertical handling by either straddle crane or forklift truck. This can be done either to and from the ground, or to and from the road vehicle. Combi-traffic with swap bodies has been used in Sweden for quite some years and the technique is well established both here and in the continent.

But in the opinion of same author, expressed in the course of supervision and discussion on this thesis, swap body type load carriers have difficulties in international traffic, especially over long distances and involving transportation through sea mode. These difficulties arise out of their structure for storage or stacking problems in the vessels, during the actual sea carriage and handling procedures. Therefore, their use in international sea-borne unitised cargo traffic is becoming increasing limited with the passage of time.

The above argument limits the number of load carrying units to be considered in this study to only two and they include ubiquitous ISO Container for Lo-Lo traffic and Trailer for Ro-Ro traffic.

4.4.2.1 ISO Containers as Load Carriers

There are various standardised sizes of ISO containers. Standard throughput unit in unitised cargo is the 20´container which is counted as one TEU (Twenty-ton Equivalent Unit) though the 40´containers is the one most frequently used these days. It is 12.1m long. The overall width is 2.44m, inner width 2.33m.

In accordance with ISO standards, these containers are equipped with bottom and top corner fittings. This enables them to be easily handled by cranes and lift-trucks that are equipped with a top lifting yoke. The container can also be equipped with fork

tunnels and grip-arm fittings, which enables it to be handled by a fork lift-truck or grip-arm equipped cranes and trucks.

Domestic combi traffic using ISO containers is relatively rare. However, combi traffic over the borders using ISO containers is extensive, particularly if sea transport is a part of the delivery chain.

4.4.3 Railway Trucks

They have several variations. [10]Special low-built rail trucks have a height of only 410 mm from the top of the rail to the top of the load platform. Truck rigs of the maximum permissible weight and overall length can be driven up onto these special rail trucks by means of a ramp attached to one end of the train.

The road vehicle and trailer are secured to the rail trucks by means of steel chocks of lashing screws attached to the sides of the truck. To unload the lashings and safety chocks are removed and the trailer can drive off the train down a ramp.

A conventional engine can haul the low-built special rail cars, on condition that a tender is inter-spaced between the engine and the low-built trucks. The tender has its front buffers fitted at the normal height, to fit the engine's, while at the back they are adapted to suit those of the low rail trucks.

The rail transport in a vertical handling system uses specially built railway trucks. The railway trucks have a drop down section between the axles in which the wheels of the trailer fit, when the semi-trailer has been loaded onto the rail truck, its wheels are choked and its draw bar is locked onto a special support disc.

There are a number of types of specially built trucks for this type of system. Swedish rail has two types. The first generally known as Sds, has four axles, is about 24.5m long and can carry two semi-trailers each about 12m long. The other called Sdms, also has four axles, is between16 and 18.5m long and can carry one semi-trailer.

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[10] This section has heavily drawn upon Jensen (1990)'s work on load carriers.

Combi-transport using semi-trailers and vertical handling has been used in Sweden for about fifteen years, and is well tested.

Railway trucks for the haulage of swap bodies of the skeletal type consist of wheels, axles and a framework. The swap bodies are loaded onto the framework and secured by container locks. Modern rail trucks are equipped with long travel shock absorbers, which reduce the shunting impact on the load, and thereby protect it from damage. Swedish rail's Ljgs-truck is of this type. It has two axles and is 14.65m long. The same type of rail truck is used for container transport as for swap bodies.

4.4.4 Discharging and Reloading System

This system within the framework of the current study is represented by a container (or load carriers') handling and transhipment terminal facility located within the port area. A predominant quantity of this cargo is increasingly being carried and handled in the form of load carriers. In this context, traffic area of the terminal means in likeness with established terminology in the transport industry, a geographical area (Jensen, 1990), within which there most often are separate docking facilities for the vehicles of each mode of transportation. Provisions of road and rail infrastructure are also made available, besides the handling and transhipment equipment.

Main cost drivers in this system are the cost of the equipment, length and breadth of the infrastructure including docking facilities both from fixed and variable cost perspectives, provision and location of the storage or parking facility for the load carriers and distances to be traversed by the handlers. These and related concepts about port terminals shall be further discussed in next chapter about Port Terminal Operations.

4.5 Service Quality of Transport Systems

The quality of transport is an important competitive feature in all transport systems in general and in a combined transport system in particular. Results of previous studies, according to Jensen

(1990), point out that the quality concept is of considerably greater importance to a transport system's possibilities of surviving in the face of competition than its treatment in the theory of traditional transport economy will seem to indicate.

Jensen has also suggested a three-step framework to determine service quality demands for a combined transport system and these steps are:

1. Defining a relevant quality concept
2. Clarifying the role of quality concept between the competing alternatives
3. Specifying quality demands for a combined transport system

4.5.1Service Quality Demands

The quality concepts considered most relevant in the case of Land Bridge are Service Time, Regularity, and, to some extent when the demand for service increases, Frequency. The way these concepts have been defined in this section has been influenced by work and thinking of Jensen (1990).

Service quality parameters in a transport system are always defined, and must be so, in line with transport buyer's quality needs. In a combined transport system, a further dictation comes from the competing system's quality level. Further, demands on the system's cost efficiency also have a significant influence.

4.5.1.1 Service Time

It is simply the time taken for transportation of cargo between two points. The transport time, according to Jensen (1990), always influences the size if the stock in transit while the goods are being moved, as well as the size of the recipient's safety stock the longer the transport time, the larger the warehouse stock and associated costs. For perishable goods transport time can, in addition, either mean costs for obsolesce or obsolesce preventive measures. Thus, from an individual transport buyer's point of view, it may be the most important service quality in certain cases.

Therefore, knowledge on the transport buyer's needs of, and sensitivity to, transport times is, become defining criteria here. At the same time chosen transport time standard can be expected to have influence on the costs of the system.

4.5.1.2 Regularity

"By regularity is meant the ability of the transport system to maintain the promised or scheduled time-tables for departure and arrivals. Deviation from the promised time schedule can have negative consequences on a transport system. One such consequence is the need of a safety stock by the recipient. Another is the occurrence of queuing situations at the shippers and/or queuing or shortage situation at recipients. All of this can be interpreted as meaning increased costs. Regularity is not a function of additional cost; it is a function fulfilled by batter management and co-ordination"[11].

Reliability of deliveries or service is another dimension to express the same concept. This parameter has a crucial role to play in establishing the Land Bridge as viable alternative to existing transport systems. By offering a relatively better standard from the start, it will help the system in attracting the fence sitters to its folds, besides consolidating the volumes.

4.5.1.3 Frequency

Frequency, alternatively defined as availability of service when demaned, is the number of departures per time unit, which, according to Jensen (1990) in turn has an influence on[12]:

Both the safety stock and cycle stock at shippers and recipients in the pre- and post-shipment systems. The higher the frequency the less the warehousing and the lower the costs, particularly for tied capital but also for space and other consequences of longer warehousing;

The capacity requirement and thereby the capacity cost in certain handling operations.

Frequency is a quality dimension, which is important from a transport buyer's point of view. If the service on Land Bridge is given a lower frequency than that of competing systems or will be unable to cater to available volumes, then it will indicate a significant failure in the system functioning. Further, demands for frequency in service on Land Bridge from transport buyers

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[11] Jensen, Arne, 1990, *Combined Transport – Systems, Economics and Strategies*, pp 63 f
[12] Ibid

are expected to increase once the service is available and fully operational.

5 POSSIBLE LOCATIONS ON THE EAST COAST

This chapter of the report investigates the locations on the other coast of the country with a view to form the eastern node(s) of the proposed Land Bridge. This shall be done in two steps through elimination and selection process.

First, largely quantitative variables will be considered to summarily eliminate unsuitable locations. In this step, preliminary criteria will be established to do the elimination and short-listing. During this process, every available/possible facility on the centre to South East Coast will be considered for selection.

A case study will then be analysed to further aid the process. It is about Onyx Logistics Centre (OLC) that wished to co-operate with the study on the larger project. Then a selection will be made discussing more of the qualitative aspects about relative strengths and attractiveness of each short listed location.

5.1 INITIAL CRITERIA FOR SELECTION

The following criteria have been chosen on the basis of viability, facts, ground realities, expert interviews and principal's preferences to adjudge the potential of possible locations. Their order of listing does not indicate any special preference or importance. Yet a certain significance cannot be ruled out at all. Few lines behind each criterion's making into the final list have been added under it.

5.1.1 Land Connectivity

Theory without a practising value is just a bunch of words. A functioning Land Bridge system will need all its components to

be in place at the time of start. Infrastructure development requires both substantial time and investments. The importance of existing in-land connections having significant potential for future development potential, thus, cannot be overstated.

5.1.2 Current Physical Handling Capacity

This is another important factor in evaluation of a port's suitability for this purpose. While selecting a location, it is obvious that we take into account its current handling capacity indicated by number of quays, births, cranes, etc.

5.1.3 Access to Open Sea

Time is the key element for the success of this alternative. Shorter reach of the calling port from open sea means shorter voyage time.

5.1.4 Maximum Water Depth of the Port

In the beginning it may not be as important a factor as others are. The system can start working with fewer volumes served by smaller ships. But, as has been said earlier, in view of the idea's future potential, wisdom dictates that a long-term approach should be taken. Therefore, to entertain and facilitate handling of bigger ships later on, this criterion should be given significant weightage.

5.1.5 Future Development Potential

This idea is inherently futuristic. Therefore, it is very important that the location selected on the East Coast must have significant potential, in all connotations of the word, for development in all respects, i.e. market expansion, facilities expansion, geographical development, etc.

5.2 Existing Ports and Terminal Facilities on the East Coast

Currently, vessel and cargo-handling facilities in the following coastal towns are to be found in our targeted area: Oxelösund, Karlshamn, Norrköping, Oskarshamn, Mönsterås, Karlskrona,

Kalmar, Åhus, Bergkvara, Ystad, and Solvesborg. The vital statistics of these ports/terminals are presented in Table 5.1 in the following pages to facilitate preliminary and easy comparison.

Table - 5.1: Ports' Capacity comparison

Name of the Port	Karlskrona Hamn	Mönsterås Terminal	Oskars hamn	Norrköping Hamn	Karlshamn	Oxelösund Hamn
Max. Depth (m)	10	8.1	11	12	14	16.5
Number of Quays	07	03	09	18	10	07
Total Quay Length (m)	1000	360	2120	4800	3500	1277
Number of Cranes	--	06	07	20	08	12
Max. Container Crane Capacity (Lo-Lo)(Tonnes)	--	80 (80)	90 (36)	320 (48)	55 (55)	36 (36)
Number of (Ro-Ro) Ramps (Total Length)	01	Nil	03 (490)	-- (170)	01(150)	02
Depth beside Ramp (m)	7.7	Nil	Max. 8.0	9.0	8.0	8.0

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Table 5.1: Continued……

Name of the Port	Bergkvara Hamn	Ystad Hamn	Solvesborg Hamn	Åhus Hamn	Kalmar Hamn
Max. Water Depth (m)	5.5	7.2	8.2	8.2	8.0
Number of Quays	03	05	04	26	28
Total Quay Length (m)	300	1400	660	1595	2600
Number of Cranes	02	04	05	07	07
Max.Container Crane Capacity in Tonnes(Lo-Lo)	60	36	40 (40)	30	36 (25)
Number of (Ro-Ro)Ramps (Total Length im m)	--	--(600)	--	02	01 (160)
Depth beside Ramp (m)	--	7.2	8.2	7.2	6.6

Source: Ports of Sweden Web site, http://www.shsf.se/index_s.htm, 2001-11-15

5.3 EVALUATION AND SHORT-LISTING

After preliminary screening of all the available facilities as per the criteria set in the earlier section, Bergkvara, Mönsterås and Karlskrona do not merit consideration on account of being too small and for either lacking Ro-Ro or Lo-Lo facilities. The last two along with Oskarshamn also lack direct voyage and open sea access due to Visby island.

Sölvesborg, Åhus Ystad and Bergkvara all have relatively shorter water depth in view of future development potential as big ports. Further, the last three are situated too southwards. This feature of theirs does not make a good case for a Land Bridge across the country's breadth. Therefore, they also have to be discounted from the list. This leaves Oxelösund, Karlshamn and Norrköping all vying for final selection.

5.4 ONYX LOGISTICS CENTRE – A CASE STUDY

This section looks into Onyx Logistic Centre (OLC) as a case study. The specific task here is to analyse the situation by drawing parallels between what is being done or have been done at OLC and the work on this study, in line with the main objective of the whole project. It is believed that doing so will add to learning and improve the quality of this study.

The information given and views expressed here are based on the visit of the group to OLC in the towns of Nyköping and Oxelösund on 16th of October, 2001. During this visit, we had a first hand knowledge of facilities at Oxelösund Hamn. We were also provided with published material about the region and other facilities. Further, information/data sources include web surfing, formal presentation made to us, and discussion and interviews with various professionals.

5.4.1Introduction

OLC itself is a small group of professionals assigned with many responsibilities. They are, inter alia, to look for ways to develop

the region as a logistics centre, arrange funding for its activities, and make recommendations to two Communes for development of infrastructure. But its prime task is to market the idea of a regional logistic centre to prospective companies with a view to attract them to the region for enhanced economic activity. We start with a brief description of the region called ONYX Logistic Centre, which OLC professionals are working to develop and promote.

The two coastal towns of Nyköping and Oxelösund are situated only one hour's drive by road to the south of Stockholm. A new transport hub is being formed here, including an international airport, one of the deepest harbours of the Baltic Sea, a motorway and railway connection.

There are ongoing substantial investments in new and existing transport infrastructure and new opportunities are being created. Central location of this centre is point of vintage. It is situated in the so-called Nordic Triangle, which links the four Nordic capitals, and middle of the expanding market of east central Sweden. Three million people, one third of country's population, live within 150 km radius in the area. They earn one third of Sweden's GNP. The close vicinity to universities, colleges and research institutes, combined with high tech industries, attracts highly educated people.

5.4.2 The Nordic Triangle

The Nordic Triangle is currently used for transportation of large quantities of freight and many passengers, and comprises of the following three major transport corridors:

1. From Oslo to Copenhagen passing through Göteborg and Malmö
2. From Oslo to Helsinki passing through Stockholm
3. From Helsinki to Copenhagen passing through Stockholm and Malmö

These corridors are of great importance not only to Nordic countries but also from an international perspective.

Götalandsbanan, the new high-speed rail project linking Stockholm with Göteborg via Jönköping, and Europabanan, another high-speed rail project that will link Stockholm to Hamburg via Copenhagen, will soon be part of these corridors. This will eliminate bottlenecks and facilitate movements of both freight and passengers.[13]

The next few sections describe all the four modes of transportation, main features of its strength, mainly taken from OLC's promotional literature.

5.4.3 Stockholm Skavsta Airport

Sweden's third largest cargo airport with one of the country's longest runways is located in the middle of the country's industrial region, where 65% of the country's export goods are produced. Cargo and passenger traffic is constantly increasing. Still there are good opportunities for expansion at the airport. It has been expanding rapidly in recent years on both the passenger and freight sides.

Forwarding agents and other transport service providers require an airport that has a large commercial potential, a good geographical location with excellent communications, fast and reliable service and low landing fees. The airport has all the potential of meeting customers' requirements and is expected to continuously expand building larger freight and passenger terminals and more car parks. A travel centre will also be established and public transport services increased.

5.4.4 The Port of Oxelösund

"The Port of Oxelösund is a deepwater harbour, close to sea, with a water depth of 16.5 metres, permitting a draught of 15.5 metres. The approach from the sea takes just one hour, guaranteeing both safe navigation and cost savings. The Port is essentially ice-free.

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[13] Brochure, "Logistics Centre East" by OLC

Every year, some 850 vessels call on Oxelösund, ranging in size up to some 110,000 DWT. Approximately 5 million tonnes of cargo pass over the quay every year, with the highest cargo volumes accounted for by deliveries of ore (1.9 million tonnes) and coal/coke (1.1 million tonnes) to SSAB.

It also load steel (0.9 million tonnes) and handle oil (0.2 million tonnes). The Municipality of Oxelösund and SSAB Oxelösund AB, each of which holds 50%, owns Oxelösunds Hamn AB. It employs approximately 210 people, with an annual turnover of some SEK 180 million"[14].

Marketed as "East central Sweden's gateway to the Baltic Sea", it is located only 15 km from the airport. It can accommodate the largest vessels able to enter the Baltic Sea. Closeness to the open sea signifies the shorter approach times for the calling vessels. This in turn means low costs, which benefits the customer and safe navigation, which benefits everyone. Its immediate access to the motorway and the railway link provides swift cargo transports.

Marketing promotional literature of the Port of Oxelösund gives a very ambitious view of its vision about future that seems a bit exaggerated. It includes whole of Russia in its hinterland and foresees even cargo from China and India passing through it. It also talks of equally ambitious plans of big investments in infrastructure. A lot of its hopes are pinned on that "something will happen in Stockholm next year or in near future", says Bo Ytterström. while referring to discussions, alternatives and political factors influencing the future of Stockholm port. But some of its infrastructure investments will certainly materialise independent of the foregoing premise.

5.4.5 Rail Network - The Nyköping and Östgöta Link

TGOJ's, a regional private sector railway company, rail link to Nyköping, 12 kilometres inland, provides an important

[14] http://www.oxhamn.se/uk_index2.asp, 2001-11-15

connection from Oxelösund to the main line between Stockholm and Malmö. In addition to the lines leading straight down to the quayside, the port is one of the few that can handle bulk goods in bottom-emptying wagons for bulk storage and onward loading onto either vessels or road transport. The port regularly loads oil for the region's power generating plants and both SSAB (a national steel making company) in Borlänge and SSAB in Oxelösund transport large quantities of steel by rail to and from the port[15].

Currently, Oxelösund is connected to the main railway network at Nyköping. Large amounts of steel are moved to and from the port on behalf of SSAB and oil is transported to many users in the central part of the country. The railways connect Stockholm and Linköping – two of the most densely populated and traffic intensive areas of Sweden. When the improved Nyköping and Östgöta link is inaugurated, access time to the main track will be significantly reduced.

5.4.6 Road Network - The E4 Motorway

Oxelösund is well served by roads with the E4 European highway running to the north, and other routes towards south and south-west along the E4 and E22. The journey time to Stockholm is 1.5 hours and to Göteborg 4 hours. Route 52 links the town with the E18 highway to Oslo[16].

The motorway cuts straight through the ONYX region, acting as the lifeline for the cargo traffic. Once established and fully developed, the region will open up great possibilities through co-operation with other transport hubs in the world through this motorway.

Overall road connectivity of Oxelösund is excellent. It is one of the few Swedish ports that have a motorway nearly down to the harbour area. This motorway links the port to the above-mentioned E4 motorway for traffic going north, south, and Southwest.

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[15] http://www.oxhamn.se/uk_index2.asp, 2001-11-15
[16] http://www.oxhamn.se/uk_index2.asp, 2001-11-15

5.4.7 Discussion and Analysis

In our discussion with the people in the region, two main reasons were quoted as significant factors which will give further impetus to development of the port of Oxelösund in particular an the OLC region in general. They are:

1. Tax-free shopping on ferries between Stockholm and Finnish ports is going to end next year (Bo Ytterström);
2. Traffic problems of congestion and environment in the capital city and subsequent politics of environment that will hinder the development of Stockholm port or at least any further investment into it.

Probability of materialising of these two events in near future was quoted as very high. As is obvious the impact of these two eventualities on both RO-RO and LO-LO traffic originating from Finland and BSRR will be considerable.

Presently more than 70% of the flow of goods to and from Finland, the Baltic States and Russia goes to and originates from south and west of the capital city[17]. Diverting cargo traffic to Oxelösund will reduce the pressure on entire Stockholm region. Also,

"Significance of Stockholm as the transport hub of the region will decrease because development of truck and trailer transport cannot be sustained at its present pace. On the contrary, there will be demands for a reduction in it for environmental and other reasons. Relieving Stockholm's traffic of more than 100,000 trucks and trailer movements per year will improve both the traffic and the environment"[18]

Regarding future investment and development, one of its plans says:

A port area with two births and adjacent storage areas will be constructed and new railway lines will be laid to the port at a calculated cost of SEK 75 million. If required, further expansion can be carried out in two stages at a calculated cost of SEK 25 million[19].

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[17] Brochure "The Port of Oxelösund – A Transport Service Centre for the 21st Century", Pp6.
[18] Brochure "The RO-RO Port of the Future on Sweden's East Coast"
[19] Brochure "The RO-RO Port of the Future on Sweden's East Coast"

Port of Oxelösund also plans to build a new container terminal which it lacks presently, at a nearby place called Stegeludden that will be connected by both new roads and two branch lines with the existing infrastructure. Existing railway traffic to and from SSAB will also be moved to sidelines from the town centre.

Besides the port and the Nyköping-Östgöta rail link, two of Sweden's most important links pass through the region – E4 for road traffic and the southern main line for rail traffic. In addition, route 53 between Nyköping and Oxelösund and TGOJ railway line have recently been upgraded to take loads of 25 tonnes. These accesses coupled with its strategic location provide the ONYX hub with a unique potential for inter-modal transport solutions.

The need for fast, safe, cost-effective and environmentally responsible transportation will increase both within east central Sweden, to and from the continent of Europe and the rest of the world. Throughout the Europe and the rest of the world, there are already hubs co-operating in a world-wide transportation network[20].

The striking similarity here is that the port of Oxelösund is also envisioning and planning along the same lines as POG is doing. It envisions itself as a connecting and channelling link among Oslo and Göteborg on the west and Finland and BSRR on the east.

Besides, OLC's vigorous marketing campaign must not be discounted in this regard. It has already achieved a considerable success in attracting some 18-20 companies to the region, which have already established their regional or branch offices here (Jan-Olof Nilsson, Project Director OLC).

5.4.8 Conclusion

Where different modes of transport meet, there is significant potential for economic development and space for growth. The combined infrastructure comprising harbour, airport, motorway and railways provides clear and simple advantages to this region. Not only by means of shorter lead times and smooth traffic

[20] Brochure, "Logistic Centre East" by Regional Development Co Oxelösund/Nyköping AB.

systems but also through low and competitive landing and port charges. Minimal congestion ensures delivery reliability and safe transport of sensitive goods.

This all combined will not only increase the logistic profile of the region but also create, due to sheer meeting point of all four modes, new volumes to be serviced by the proposed Land Bridge. The role of Skavasta Airport in this regard needs no emphasis. It can only add more colours to the projection.

The Baltic Sea region itself is sending interesting signals. It is a region comprising of an expanding market. Over 100 million people with growing purchasing power live on and close to the coasts of the Baltic Sea. This means there is large trade potential for the whole of northern Europe. It will be fair to state that

"in the region of east-central Sweden, with the ONYX region acting as a hub, the conditions exist, therefore, for developing the region into a gateway with even more efficient transport services".[21]

5.5 OTHER COMPETING PORTS AS NODES

Without any prior intentions, just out of a necessity to provide a fair comparative perspective and discount any undue advantage to Oxelösund, it was decided to present the case of other two serious contenders in this regard. Next sections discuss the port of Norrköping's and the port of Karlshamn's options, though a bit briefly, vis-à-vis the requirements of this study. Opinions expressed in both cases have been formed on the basis of interview with Mr. Melin and information gleaned from their respective web-sites.

5.5.1Port of Norrköping

The Port of Norrköping has rapidly expanded its operations in recent years, and is already serving as a Baltic base for scheduled trans-oceanic traffic. "Norrköping is superbly positioned from the standpoint of both geography and infrastructure. It has made major investments to bring the capacity of the port up to its

[21] Brochure, "Logistic Centre East" by Regional Development Co Oxelösund/Nyköping AB.

logistical potential" (Bengt-Erik Bengtsson MD). The southern quay and the Öhman quay handle forest products, grain and not least the Port's fast-growing container traffic. Thus, it hopes to play a leading role in the future of the Baltic region.

Norrköping regards itself as a key port for scheduled trans-oceanic traffic. In it's forecast,

"Things are heating up in what is expected to become one of Europe's hottest markets in the next several decades. Industry heavyweights have started to make their way into the Baltic"[22].

5.5.1.1 Market Perspective - "Centre for Nordic Distribution"

Norrköping's importance as a transport centre is constantly growing. The causes behind the trend include infrastructure linking all four modes of transport and a geographical location close to important markets. Transport infrastructure along with a large, highly developed transport sector have led many major companies to select Norrköping as their Nordic distribution centre.

5.5.1.2 Rail Connections

The Port of Norrköping is adjacent to one of Sweden's most important stretches of railway: the main southern line. every section of the port is connected to it by an unusually well developed industrial track network. Cargo is reloaded directly on the quay with cranes and forklifts. The port area has both a marshalling yard and a Combi terminal for transhipment between ships, trucks and the railway.

5.5.1.3 Air Link

Just a few kilometres south of the port is one of Sweden's largest airports, with frequent departures to important domestic destinations. Several flights depart daily for Copenhagen, linking Norrköping to an air network that stretches throughout Europe and much of the rest of the world.

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[22] www.norrkoping-port.se/nhs_eng/om_hamnen.asp, 2001-11-15

5.5.1.4 Roads Network

Two European highways (E4 and E22) and several major national highways (51, 55 and 56) originate in or pass through Norrköping, which, thus, has excellent road links to cities such as Stockholm, Oslo, Gothenburg, Malmö and Copenhagen. Despite its central location, trucks can reach the port without having to pass through densely populated areas.

5.5.2 Port of Karlshamn

The port of Karlshamn is the dominant industrial and commercial port in Southeast Sweden. The inlet is wide and deep. Easy navigation in combination with efficient equipment saves time and money through quick dispatch of the vessels. There is no waiting time for release of import cargo and export cargo can be delivered to the port at flexible hours. There is a rail connection to the quay and direct access to the motorways R29 and E22. Therefore, the pick-up and delivery of containers, trailers and other equipment and cargo is fast and cost-effective.

In a sheltered location with a natural water depth of 14 metres, the Port of Karlshamn is unique in the sense that it provides excellent navigating conditions that is ice-free all year round.

5.5.2.1 Market Perception – 'Unique Location'

The port of Karlshamn is located in the centre of the most industrialised area in Southeast Sweden. The location is strategic, for traffic both towards West and East Europe. The majority of the Capitals and population centres in the Baltic can be reached within 12 hours. The port is right in the middle of the new transport corridors, leading to the new markets in former Soviet Union/East Europe, where the flow of goods will grow more than five times during the next ten years[23]. The location and infrastructure makes Karlshamn the nearest full service port in the region, measured both in kilometres and hours.

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[23] www.karlshamnshamn.se/english/english.html, 2001-11-15

In the latest issue of its annual *News Letter*, in an article titled "TransPort in Fokus" it further provides glimpse of its market focus saying:

(After the collapse of the Wall and Eastern block,) the Baltic has once again become a sea of opportunities. Western Europe's commercial battlefield has been replaced by the virgin territory to the east. Centuries of experience of international trade in Karlshamn will now come into its own. We are positioned close to the new, major markets on the European continent, as well as to the expanding region on both sides of the Öresund Bridge. And the Karlshamn port facility is already among the largest in the country.

During the first decade of the third millennium, transport of goods over the Baltic will double. Our neighbouring market currently includes a population of at least 70 million. The EU is expanding eastward; Sweden is moving southward. And the Öresund bridge is opening completely new visions and opportunities. …….Today the port is being developed into a regional cargo hub, where efficient reloading between ship, truck and rail can take place. Therefore, a larger part of the work is concerning handling in- and to/from warehouses, containers, rail etc.[24]

5.5.2.2 Rail Connections

The Stilleryd harbour has railway tracks to the quay, enabling cargo handling directly between vessels and rail wagons. The tracks are connected to the coast railway of Blekinge. In order to improve the integration of sea, rail, and road further, the port of Karlshamn and the Municipality have the intention to move the marshalling yard, now located in the city, to the Stilleryd Harbour. The southern most Rail Combi terminal is situated at Älmhult at a distance of 79km.

Work on a much needed railway link between Blekinge coastal railway and Olofström under the name of 'South East Link' is also in process. This is the result of a new investigation, initiated by the municipalities of Älmhult-, Olofström-, Karlshamn-, and Port of Karlshamn, that projects an increased demand for transportation between Blekinge and Gothenburg.

5.5.2.3 Road and Air Links

The port in Karlshamn have direct access to the main roads E22 and R29. Distance to Göteborg is 307km. While the distance to

[24] www.karlshamnshamn.se/english/english.html, 2001-11-15

the nearest airport Kallinge/Ronneby is 30 km. The airport has direct regular connections to Stockholm and Copenhagen.

5.5.2.4 New RoRo Service and Logistic centre

A new RoRo Service between Karlshamn and Klaipeda in Lithuania has recently started. The port has also initiated the idea of a storage and transhipment centre in connection to the port area in Karlshamn to meet existing and future needs for storage, as a result of outsourcing.

5.5.2.5 Liner Services

There are liner services to and from Karlshamn: world-wide weekly service on every Tuesday by NYK, P&O-Nedlloyd, Hapag-Lloyd and other global carriers and a biweekly and monthly service to three destinations in the UK

5.6 COMPARATIVE ADVANTAGE OF PORTS – A QUALITATIVE VIEW

In the foregoing sections, ample information has been put together and discussed, sometimes bordering on irrelevancy as to the central theme of this study but deemed necessary, to demonstrate and highlight the respective positions of the main contenders. Ports' respective market focuses and land infrastructure connections have been discussed to demonstrate their individual advantages and overall comparative advantage. The overall conclusion is that all the ports have slightly differing focuses and are well positioned to pursue their market objectives.

Norrköping is the most developed port at present. Its biggest disadvantage despite being a fully functional port and excellently connected with in-land logistic infrastructure, is its long reach to open sea. This means that it does not have an open sea access and calling vessels take 3-4 hours to dock into the port from open sea. Otherwise it has excellent modal links, handling capacity and infrastructure. Operations pertaining to Land Bridge can be started without any additional investment and immediately.

Second contender, Karlshamn, is also a full service port. Its comparative advantage is that it is an open sea port with a short reach when compared with Norrköping and is a functional container port for LO-LO traffic when contrasted with Oxelösund. Its other positive point is that it is situated near to Rail Combi's only southern most terminal at Ämhult.

Last, but definitely not the least, Oxelösund has service time and cost advantages that stem from its geographic position and under utilised potential/ capacity. It also has big development potential in future. It current scale of operation and facilities provision mean that it is not ready to participate in the venture under study in near futures.

But considering cost and service time aspects that are the two most important variables in this study, Oxelösund definitely has an edge. In the end, it is recommended that it will be misleading to read too much into catchy phrases and slogans coined to market their respective positions.

External variables like service flexibility and long term prospects will also impact upon the final choice. To offer flexibility in choice of service and enhance potential cargo volumes, it is recommended that at least two locations should be selected. It will not only help facilitate a choice for feeder and line vessels but also distribute operational loads on all partners in chain due to increased volume in future.

In projects involving infrastructure developments and further investments, a long-term view is always advisable. Therefore, the case of the port with strong and significant future development potential has been advocated. Still it goes without saying that the final selection cannot be made in isolation. Transport chain partners' (Rail Combi possibly one among them) preferences have to be taken into account and may force a decision. But for the moment, Oxelösund and Karlshamn are the final choices.

6 PORT TERMINAL OPERATIONS AND COSTS

In this chapter, operational activities in a terminal facility will be discussed. The basis of information and data is the author's own observations and experience in terminal operations though in a different environment yet generally applicable, and interviews with experts in the field and practising managers.

Documented knowledge or a prior market study regarding the customers' (shippers and forwarders) decision-making criteria or preferences for choosing a shipping or delivery service related to this study is lacking. The group working on this combined project has, therefore, assumed that lead or throughput time and cost per cargo carrying unit will be prime decision factors. The assumption is not totally without reason. Simple business economics sense espouses this view.

Precisely the yearning to reduce time and cost of cargo transportation between the origin and destination of the flow is the inherent reason to study the possibility of a Land Bridge. Therefore, these service and cost variables will always get preference over the rest while defining a perspective for investigations. The discussion should naturally start with a theoretical description of a port terminal.

6.1PORT TERMINAL

The principal function of a port terminal is to provide facilities to transfer goods between ships and other modes of transportation. In some cases there are also cargo transfers between different forms of sea transport. The terminal adds value by creating an opportunity to transport the consignment to a place and time where its utility is larger than at its present

location. The value is added by creating opportunities to exploit economies of scale and by enabling the means of transport to operate independently. In addition to this, a port terminal can offer a variety of other services (Jansen, 2001).

There are several operations that are, and have to be, carried out in a port terminal. Some of the activities related to the main function of a port terminal are:

- Loading and unloading of cargo
- Stevedoring
- Cargo tallying, inspection, survey
- Sorting/Consignment grouping
- Cargo Storage
- Administrative and commercial handling (Jansen,2001)

6.1.1 Port Terminal Infrastructure

The performing of above activities needs some infrastructure provisions. The main infrastructure of a port terminal is seen as consisting of following major provisions:

- Docking facilities
- Traffic area
- Storage/parking facility
- Transhipment equipment

6.2 PROFILES OF THE RESPONDENTS

First is Mr. Claes Sundmark, Manager Sales and Marketing with POG. He has been in this field since 1995. The interview took place at the head office of POG on 14th of October 2001. My second respondent is Mr. Bengt Melin, Managers Operations, Port of Karlshamn. He has an experience spanning over 28 years in port terminal operations. I spoke to him on his office phone # 0454-305020 on 2001-11-20. The last respondent is Mr. Bo

Yetterström, Manager Marketing Dry Cargo at Port of Oxelösund. He has an experience of 24 years behind his opinions and views. I interviewed him during our visit to Onyx Logistic Centre on 16th October 2001.

6.3 OPERATIONAL ASPECT

Two limitations about the observations and study must be stated here. As decided in the chapter about theoretical framework, only containers and trailers as types of load carriers will be entertained. Only those trailers will be taken into account that will be booked for transportation beyond POG. In other words, trailers that will be handled/driven by drivers during terminal handling and/or driven by accompanied drivers over the Land Bridge will be discounted in this study.

These assumptions are necessary to avoid confusion and complexities. This will leave insignificant dissimilarities between operational treatment of the containers or Ro-Ros and its impact on cost and service variables.

6.3.1Systems Boundaries

To isolate the relevant costs and allocate them properly, it seems appropriate to demarcate the system boundaries of each subsystem. As mentioned elsewhere in this report, port terminals on both coasts form one subsystem and the link between any two terminals constitutes the other subsystem.

The system boundary for the land modes can start at the point where train or truck comes 'under the crane' for discharging and end at a point where the units are to be loaded on the respective vehicles. These points could be the respective 'docking' facilities for load unit discharging and loading.

On the seaside, delimiting point is the quay beside the vessel docking place/facility for discharging and reloading unit loads. The land-sides of the above demarcation at both ends of a link or distance between the two terminals constitute the boundaries for the third component or subsystem.

6.3.2 Components in Sub-Systems

6.3.2.1 Unit Carriers

From a system perspective there are essentially two components in this category: Containers and Trailers as Roll-on Roll-off (Ro-Ro) units. Their uses, sizes and specifications have been discussed in the chapter about theory.

6.3.2.2 Handling Equipment

Handling treatment for both units is different from each other. It essentially stems from difference in their respective structures, which also has separate consequences for their subsequent movements during the handling activities. It also means that both units require different handling equipment that is also what the practice is.

6.3.2.2.1 Container Handlers

- Lifting Crane
- Straddle Carrier

6.3.2.2.2 Ro-Ro Handlers

- Fork Lifter
- Tug Master

6.3.3 Load Carriers' Movements Within the Terminal

In the case of transit cargo, handling and movement of the unitised cargo will be different from the treatment given to cargo originating from or destined to Gothenburg or its surrounding region. An analysis of cargo movements within a terminal reveals that the terminal has to have two entries and two exits: one each for land and sea. Actual movements or flow within the terminal for cargo is explained in the next section.

6.3.3.1 Container Handling Activities/ Movements

Movements within a terminal area are a function of distances, storage capacity, provision or availability of docking facilities for each mode and handling capacity measured in terms of equipment availability. The following movements have been observed in POG's case:

1. Lifting of container from the chassis or train body and putting on the ground
2. Picking up by the Straddle carrier and moving to Parking/stacking area
3. Then again through the same equipment to the quay side place
4. Finally, lifting the container from quayside and loading it on the vessel.

Only the sequence of movements is reversed for an in-bound container without any additional movement.

6.3.3.2 Ro-Ro Handling Activities/ Movements

These are almost similar with the same sequence except that different equipment is used. Fork lifter is used for activities 1 and 4 instead of lifting crane. While Tug Master replaces the Straddle carrier for movements 2 and 3. Sequence is of course reversed for in-bound cargo carriers without any addition or deletion.

6.4 HANDLING COSTS AT DIFFERENT TERMINALS

The argument developed previously about movements within the terminal being a function of various factors, foremost among them being the transhipment distance between docking facilities for respective modes, continues here. The logical consequence of this assertion will be that handling cost in turn is the function of number of moves per unit.

In this section, following the above argument, I discuss that how much handling of unit loads will cost at each of our selected terminal locations. The cost figures are not readily available for all the location due to obvious reasons that at Oxelösund, container cargo is not being entertained at the moment.

The case of Karlshamn is, however, different. An elaborate cost /price structure exists based or calculated on number of moves but is not applied commercially. The reason: Its volume and customer base are not adequate yet. It, therefore, has preferential price agreement with its current sole customer. Moreover, it has declined to reveal that price.

POG in reality charges a fixed and known charge for its terminal handling service. Although its basis is same as that of in Karlhamn' case but due mainly to scale of its operations, range of services and breadth in customer base and to keep things simple, it has adopted fixed charge alternative.

6.4.1Handling Cost at POG

Terminal handling cost is SEK 275 per unit handled irrespective of the size or specification of the load unit carriers being examined in this study. The cost is also same whether it is an in-bound unit or out-bound. This seems logical, as there is no difference between the number of movements and/or activities for both types in the case of POG.

6.4.2 Handling Cost at Oxelösund

Container terminal facility here has yet to be established. But based on its experience with other load carriers, port authority has quoted only tentative cost figures, in one case consisting of a range due to fore-stated reason. Unlike POG, it seems to differentiate among unit types specification and size. Unit Costs in SEK are: for 40´container 850, for 20´container 550 and for trailer 225-250.

6.4.3 Handling Cost at Karlshamn

As mentioned earlier, the port has rather an elaborate price/cost structure. A load carrier's 'move' within the terminal is basic cost

unit. Loading or discharging of a load carrier of any type or specification is counted as one move. One move costs SEK 155. Besides, there is a Port Dues charge on each in-coming or out-going load carrier equal to SEK 142 and an administrative fee of SEK 10. This brings the per unit cost for an in-coming or out-going container to SEK 307 while 310 is the round figure. Both container specifications are handled at the same price.

Trailers without any towage demand in terminal are also treated as containers. Thus, have the same price of SEK 310. But if additional 'moves' in case of containers or towage in case of trailers within the terminal area is involved, then it will further add to cost of handling. One towage activity costs SEK 230. There are cost figures available for other specification and load carriers but their mention will be avoided here.

6.5 SERVICE QUALITY

Service quality considerations for transhipment activities in port terminal are expected to be different than that of during the actual transportation. The difference arises out of the nature of operations, which is characterised by a greater degree of complexity in port terminals speaking in relative terms. From a perspective of our predefined service parameters of service time, regularity and frequency, only the first two will apply and that too, to a varying degree.

Efficient operation in the terminal can ensure optimal service time while the load carriers are transhipped within this subsystem. In this way, it is an independent variable. But considering the complete transport chain, it is also a dependent variable if load carriers' handling time has already been affected in either way in earlier part of the chain. Or it will be affected in the subsequent links of the chain.

On the other hand, regularity is a completely dependent variable if we adopt 'flow' thinking. Only 'reliability of the flow' can be affected independently by the terminal activities. Otherwise the degree of regularity will be a function of scheduled arrival time from the prior link.

6.6 SERVICE TIME AT DIFFERENT PORT TERMINALS

Service time calculation for a load carrier in a terminal is a bit complicated as the priority is given to reduce vessel's time in port. Other important aspects in this respect are co-ordination between arrival and departure and of discharging and loading activities for both vessel and train, and sorting activity of discharged load carriers. Service time in a terminal also depends in parts on the handling/operational capacity and transhipment distance in a particular port. For example, distance between quay and railway line at Karlshamn terminal is 5 metres at the shortest point while it is 400 metres from an average point in case of POG. So, it is purely a matter of the individual port's circumstances, objectives and priorities and how they are defined.

In the case of POG, individual container transhipment takes 20 minutes minimum and 30 minutes in the worst case. A whole train carrying 30 units of 40 feet containers in most efficient handling "should be able to leave the terminal within 2 hours after the last container has been discharged of the vessel but the total turnaround time is not more than 4 hours in any case", says Mr. Sundmark. The above situation applies to a turn around trip that means a train arriving and departing fully loaded. But a single loading or discharging activity for a train loaded with 45 mixed (20´, 40´ containers and trailers) unit will take on average one and half hours.

Service time is also function of real experience. In the absence of an operating container terminal at the port of Oxelösund, it is not given.

As regards the service time at Karlshamn, this facility seems more efficient, perhaps due mainly to its small size. Individual container/trailer transhipment does not take more than 5 minutes. A full train as mentioned above can leave the terminal within 1 to 2.5 hours in all cases.

6.7 MODAL DIVIDE AT POG

It will be interesting here to look at the current modal divide of load carriers particularly containers between both modes of land transportation. It can help define the perspective for further discussion in coming chapters and influence our thinking regarding the selection of the most suitable mode of transportation on the Land Bridge. For this purpose, only statistics from POG will be looked into.

Currently, modal divide is heavily tilted towards the road hauliers, as a very minor share of Ro-Ro arrives by train. Current figures are 2000 Ro-Ro units out of a total of 0.4 million units annually. While figure for rail transportation of containers is relatively higher which is currently 20% of the total annual volume. The similar statistics for other ports being considered in this study could not be made available due to various reasons.

6.7.1Modal Cost Behaviour

It is now well-established that rail mode is characterised by very high fixed costs and rather constant/stable or decreasing variable cost depending upon the level of operations and capacity utilisation. The variable cost tends to decrease per unit over large volumes of throughput. Further treatment to this topic will be given in chapters devoted to both modes.

7 ROAD LINK

In this chapter, I shall discuss the possibility of road links for the proposed Land Bridge between the selected locations. The information here is mainly based on views and opinions expressed during the interview with a seasoned professional from a well-known company in cargo haulage business, besides information gleaned from some secondary sources. My review parameters will remain the same, i.e. operational aspect, service quality variables and costs.

7.1PROFILE OF THE RESPONDENT

Mr. Dennis Crantz is Sales Manager at Skoglund Transport System (STS). He has been in this profession since 1980. I interviewed him on 11th of October 2001 in his office. STS is the largest business concern of its kind in the better part of south Sweden. It operates in private sector and has a turnover of about 150 MSEK. It has been in the business since 1982 and is a single company without any affiliation or sister concern. Its only business is to provide road cargo haulage service with a resource base of 100 trucks.

7.2 OPERATIONAL CHARACTERISTICS

It is a norm in road transport business that prior to commit operational resources on any route, haulage distance is determined on a round trip basis. This is how the economy of such businesses works and is evaluated. Round trip haulage distance for both the selected locations of Oxelösund and Karlshamn form Göteborg is 772 km and 645 km respectively. Service is charged at a price of 8 SEK per kilometre. Industry standard for service time is 70 km per hour on fairly medium and long routes. This also goes for service provided between inter-

city or town destinations. This may vary and shorten for distances within city destinations for obvious reasons of speed limits, road congestion, etc. But for our purpose it is sufficient to base our calculations on the above mentioned service time as both routes fall in the category of long distance.

Service is rendered on the basis of comprehensive service contract signed with individual customers. In most of the cases it is not route based scheduled service. It is entirely dependent on the wishes of the customer who pays for the service hired.

Haulage or delivery route is chosen from service time consideration. Usually the fastest route in terms of allowed speed limit is chosen because it is cheap and cost is the foremost concern in the industry. Years of industry wisdom and practice are the reason behind it, which in turn is mainly based on all business economic considerations.

Regarding unit load characteristics, the predominant majority of unit loads consists of Full Container Loads (FCL). Among containers' unit specifications are also use of 40´s is heavily favoured. STS' statistics for unit load characteristics are 90% FCL, 5% Less-than Contain Load (LCL) and 5% of Trailers. But these figures might be a distortion due to the fact that Maersk Line is the biggest customer of STS and 98% of the business comes from it alone. STS deals with 80-85% 40´s and 15-20% of 20´s in its business operations

Regarding the competitiveness of road mode in comparison with rail, depending upon individual perspective opinion differs in the industry. Some say that road mode is competitive if the distance is upto but less than 400 km (Crantz). While others put it at 330-350 km (Melin), 300 km (Sundmark) and 200-250 km (Thunborg).

7.3 COST OF ROAD HAULAGE

Looking at the theoretical basis of costs incurred by the road hauliers, one comes to notice the usual two main components: Fixed and variable costs. But from another perspective the total cost can be viewed as consisting of direct business related costs

and socio-economic costs. Although the latter are mainly born by the society, yet mechanism exists to transfer it to the transport providers and extract, at least, some part of it from transport users in the form of taxes and levies. Some elements of the both categories cut across the main components of fixed and variable costs.

So, pigeonholing them into specific boxes is a pretty difficult preposition. Suffice to say is that while the direct business cost is almost equally divided between fixed and variable components, the socio-economic costs which when internalised become indirect business or internalised costs have mainly a variable character except a minor content falling into fixed cost. Separate listing for each category and component is provided next.

7.3.1Direct Business Costs

- Vehicle cost
- Crew Cost
- Maintenance and Repair cost
- Fuel Cost

7.3.2 Indirect Business/Internalised Costs

- Infrastructure tax
- Fuel tax
- Costs due to zonal restrictions and speed limits
- Other levies and tariffs

7.3.3 Fixed Cost

- Capital Cost of vehicle, other equipment and establishment, etc.
- Administration and salaries
- Other overheads

7.3.4 Variable cost

- Fuel cost (most of the socio-economic costs in the form of taxes are included in it)
- Maintenance and repair
- Cost of Tyres

7.3.5 Time and Distance Dimensions of Road Transport Costs

Another perspective while discussing transport related cost is to look into the matter from time and transport distance dimensions. For example fuel cost from this perspective is distance dependent while capital cost erosion in the form of depreciation in the value of vehicle or equipment is time dependent cost. Cost of tyres can both be time and distance dependent cost.

7.4 COST TO CUSTOMERS

All above cost elements go into the making of a unit cost to the customer that is always charged on per km basis. But what is the actual cost incurred by a particular haulier for a link or trip is a closely guarded business secret, which nobody in the industry is willing to share. It is also understandable because it varies from company to company. Along with service network and coverage area, it is also among the main bases of competition in the industry.

Competition in the industry can affect the cost in a significant way but it also has its limits like whether it is inter-mode or intra-mode. Current market is characterised by 4 to 5 fairly large companies, which operate and compete in the region under discussion in the study.

7.5 PRICE SETTING

Although the nominal industry standard price of transport haulage service is SEK 8 per km but it is seldom the actual price

charged to the customer. Foremost price setting basis is the distance to be hauled and it is always calculated and quoted for a round trip even if the vehicle has to return empty. After quotation it is open to negotiation and mutual bargain on case to case basis. Delivery time window is also important for determination of actual price. Shorter time window will always demand a bigger price than the larger one.

An overwhelming consideration and concern for road hauliers, perhaps more than any competing mode, is imbalance in cargo transport demand. If a haulier has not got a full trip, it will also take into account the possibility of finding some return cargo from some other customer while negotiating a final price. Here their cargo picking network and points all over the country facilitate matters for them a bit. In the end it will be only fair to conclude that though theoretical concepts and basis do serve a purpose to give an idea of fair price but in the end it is the larger business economic considerations vis-à-vis prevailing supply and demand conditions which help set the actual price.

7.6 SERVICE VARIABLES

As we are concerned with the total throughput service time for the entire flow till and from Göteborg in this subproject, I shall define this variable on a one-way basis to facilitate calculation and in conformity with the other subprojects. Thus, calculated one way service time between Göteborg and Oxelösund is 5 and half hours while to and from Karlshamn it is 4 hours and 36 minutes one way. It is not possible to reduce this service time because industry is already operating at an optimal service speed level of 70 km per hour.

Looking from another perspective, an increase in average speed from 70 to 80 km will increase the fuel consumption by 10%. This aspect of transport studies has lately been very well researched. Detail statistics and studies exist now that can be checked for further details. Besides, there are various other considerations and restrictions imposed by law like fuel efficiency, engine life, and environmental and societal concerns like road congestion and risk to life in the event of an accident.

Road hauliers are definitely costwise. But service time is also of equal importance when they compete in selling for their service. Among the service quality variables, service time has clear preference as a competitive attribute among the companies.

My respondent has expressed apprehension about the road mode's ability to compete effectively in view of long distance of the Land Bridge for both routes. This is a genuine concern and an unavoidable obstacle. Another discouraging factor in this regard is potential volumes that are expected to increase once the Land Bridge idea materialises. It will not make for sound business sense to bring a 'train of trucks' on road to cater to volume demands. Increased traffic on roads shall definitely add to road congestion and worsen other social dimensions.

Instead it is more common sensical and business economical to commission a cargo train. Mr. Crantz opined that once the volumes on the Land Bridge are available, a road haulier might enter the competition with Rail Combi by hiring a private cargo train service. Though the terminal conclusion from the information and discussion in previous pages is that service by road transportation mode will not be economically feasible, yet road transportation cannot be bereft of it importance in emergent and especial delivery requirement situations. Therefore, a complementary role is not entirely ruled out in the purview of this study.

8 RAIL LINK

This chapter explores the viability of a rail link for this alternative. Discussion parameters shall remain the same, i.e. operational characteristics, cost and service variables. The information provided and views expressed in this chapter are based on an interview-style discussion with Mr. Micael Thunborg of Rail Combi on 26th of October 2001.

8.1PROFILE OF THE RESPONDENT AND THE COMPANY

Mr. Thunborg is Key Accounts Manager with responsibility for major shipping lines. He has been with the company for more than one and half year. But overall he has 15 years of experience in Ocean Freight industry.

Rail Combi works with the slogan of "Trains and Trucks in Partnership". Its avowed business concept is:

Marketing, producing and developing combined transport solutions of individual load carriers to hauliers, forwarding agents, logistic companies, shipping lines and railway operators

In order that our customers, by choosing combined transport – which meets tough requirements relating to the environment, security and service – can ***reinforce their competitiveness***.

It has five main customer segments; namely railway operators, forwarders, hauliers, logistic companies and shipping lines. Its entire business is almost evenly distributed among these segments. It operates 16 purpose built terminal at 14 locations all over the country with the help of 175 employees and approximately 1000 trailer and container wagons. Other equipment includes 23 reach stackers and 8 cranes.

Its ancillary services include depot, collecting and forwarding, technical advisory and advisory about hazardous goods with the help of integrated administrative, technical and traffic system. It also offers EDI track and trace and Internet booking facilities[25].

8.2 OPERATIONAL CHARACTERISTICS

8.2.1Prerequisites for Service

Obviously, infrastructure availability, here mainly the availability of tracks, comes the foremost. Next logical thing is the track capacity, which not only means that whether it is a single or a double track but also track time availability for cargo trains. Another dimension of track time is the priority accorded to cargo traffic in relation to passenger traffic. Currently Rail Combi has the same priority as that given to X2000 and may even have higher priority in some case when X2000 is running behind schedule.

Another essential prerequisite is the availability/ existence of sufficient cargo volumes. The minimum volume that can attract a scheduled rail combi service between two certain locations is about 80-100 TEUs. To establish a combi terminal, bare minimum requirements are one Reach Stacker and two personnel and a skeleton infrastructure development will roughly require one million SEK.

8.2.2 Current Combi Services

Rail Combi services daily traffic among its network of terminals with fixed schedules. The train's load carrying capacity is kept flexible and ranges between minimum of 5-6 wagons to at most 30 wagons. Individual wagon capacity is between 2 to 3 TEU or equivalent. Currently it does not have any terminal facility on the south-east coast (focus area of this project) of the country except Norrköping if we are prepared to consider the town location among our focus area. Though it operates from terminals of Stockholm and Gävle, also on the East Coast.

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[25] Brochure on Rail Combi

8.2.3 Shuttle Services

Besides the normal/regular service described in previous section, there are five shuttle services operating among the larger cities of Scandinivia with convenient frequencies. They are:

8.2.3.1 The Atlantic Express

It is a contiguous train for containers between the harbours in Gothenburg, Norrköping and Stockholm. It departs in both directions every evening from Monday to Friday.

8.2.3.2 Gothenburg Oslo Rail Express (GORE)

GORE is a shuttle service that operates five days a week between the harbours in Gothenburg and Oslo.

8.2.3.3 Scandinavian Rail Express (SRE)

It is a train for containers, semitrailers and swap-bodies which operates between Trelleborg, Malmö and Oslo.

8.2.3.4 The Baltic Rail Express

Dubbed as the corridor between the east and the west, this link between Stockholm and Oslo, which operates overnight, departs twice a week in both directions and is the result of co-operation between NSB Combi Xpress and Rail Combi.

8.2.3.5 Nordic Rail Shuttle

This service operates via Öresund Bridge. It is a simple and fast corridor between Copenhagen and Stockholm where Stockholm acts as a hub and offers simple connections with ferries to and from ports in Finland and Baltic States[26].

8.3 RAIL COMBI'S PERSPECTIVE ON LAND BRIDGE

Rail combi has indicated Karlshamn, Åhus Oskarshamn and Södertälje as the possible locations on the east cost for this idea and Gävle, Karlshamn or Åhus as preferred location to route its

[26] www.railcombi.se

combi services towards and till Göteborg. The reasons put forward for these choices are: good potential of cargo moving into the south of Sweden, especially trailer traffic to the EU because of large queues on borders of Baltic States.

The issue of trailer traffic from BSRR and border crossing is a very significant signal for future market potential. This point was further corroborated in a seminar on transport sector restructuring, held in Riga on November 16 and 17, 2000 where one of the principal conclusions of the seminar in the roads and road transport sector was "the urgent needs to expedite border crossings"[27].. The delegations of the Governments of the three Baltic states participated. The EU, EBRD, EIB, and ECMT also joined the World Bank at the Seminar, and made a significant intellectual contribution to the proceedings.

Until the above situation exists, going through Sweden will remain attractive. Crossing the Baltic Sea means only one border crossing and the vehicle is in the EU.

The other choice by Rail Combi in this regard is Gävle. The reason is purely operational economy in the provision of service. More potential cargo can be combined with the existing one to get economy on the regular train by attaching 2-3 more wagons to it.

8.3.1Critical Elements/Activities

As is always the case, information and its quality are deemed critical resource, especially regarding the market intelligence like demand characteristics from customers and their changing nature is a constant requirement. Infrastructure development and maintenance comes after it. As an independent profit centre, Rail Combi has to make investments from its own resources to expand its business.

A shortage of train drivers has been a constant phenomenon in Swedish railway for the better part of its life. Though Rail Combi has a fixed inventory of drivers on its disposal but it is often

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[27] E-mail from Professor Arne Jensen, dated October 04, 2001.

deemed insufficient. Their service duration timings, rules and union regulations further complicate the matter for the management. It also has complicating connotations for cost calculations.

8.3.2 Rail Combi's Preparedness

There exists a procedural system to conduct business in every business concern. Planning is a crucial function in this procedure. Usually at Rail Combi, it takes six months to plan and implement new operations and planning exercises are scheduled in January and June each year. In this instance, Rail Combi has indicated its willingness to share the risk with POG.

At the moment on a short notice it can provide a Combi service from Karlshamn (one of our chosen locations) and is capable of transporting 30 TEUs per week. As mentioned earlier, given the sufficient time for planning and subject to reliable and adequate volumes of flow, there is 'no problem at all' in launching a regular service.

8.4 SERVICE QUALITY

Rail combi provides a guaranteed on-time service and pays the customer a financial charge, which is an agreed fraction of the total service charge, if it falters on its promise. It explains why 95% of the time its delivery is on time. Further, its service is considered relatively environmentally responsible and also it is the only option for transportation of large volumes of cargo over land over long distances and competitively too, as road mode is competitive over an upper distance range of 250-350 km.

As currently combi service is unavailable on the routes under discussion in this study, therefore, actual costs and service time are not available. Based on his experience and business economic calculations, my respondent has quoted a one-way ex-handling service time range of 5 to 10 hours between Oxelösund and Göteborg while he estimated it 8 to 10 hours for Karlshamn-Göteborg link. As is obvious these are rough and very, very 'safe' estimates due to the fact that system is not working yet. But on the assumptions of a fully developed and efficiently running

system, there is reason to count on the lower side of the range or mean of the range in both the cases.

Competition among cargo train operators is also growing. At the moment companies at very small levels are coming up. But these are only niche operators. Competition in the railway sector has also to do with government's policy. Sweden has one of the most de-regulated railway markets in the Europe, perhaps only second to the UK.

Frequency is another important variable when it comes to evaluation of service quality. But it is largely a function of flow volumes though in part it also depends on, and is sometimes restricted by, track capacity, management and availability.

8.5 COSTS OF SERVICES AND THEIR CHARACTERISTICS

Currently, Rail Combi has separate service charges for different specification of units. Sizes and status of ISO containers are charged differently which means empty 20´ is at one end and full 40´ is at the other end. Among status of containers it recognises only full or empty, no in-betweens.

On the other hand it does not discriminate among full or empty trailers or swap bodies and has the same load unit rates for each. The service is charged in SEK per unit booked from origin to destination. It does not charge a slab rate that means it has different rates for different distances depending on amount of kilometres.

For the purpose of this study, I have been quoted a very rough and 'safe' range figure for all types of units that can give a reasonable idea of what the actual cost will be when the system will be running with complete efficiency. Safely estimated cost of haulage of one unit of any type between Oxelösund and Göteborg will be from SEK 2500 to 3000. For the other route, it will be between SEK 2200 to 2500. A rough estimate of its one time terminal handling cost is 300 SEK per unit irrespective of the specification of the unit handled. As discussed previously,

these rough estimates will be considerably adjusted downwards in real situation under influence of various factors.

8.5.1Cost Components

These are categorised under two usual main heads, namely, fixed and variable costs. Details of constituents of each are given below.

8.5.1.1 Fixed Costs

The following are the prominent components of this category:

- Capital cost of purchasing/leasing wagons and locomotives
- Overheads (all administrative including drivers' salary)

8.5.1.2 Variable Costs

The following are considered variable costs by virtue of their behaviour:

- Infrastructure tax (paid for the use of tracks and signalling and control system)
- Maintenance cost (both for wagons and locomotives)
- Fuel / electricity cost
- Overtime

8.5.1.3 Complicating Factors

This seemingly simple picture gets complicated when confronted with the fact that locomotives are owned by Green Cargo, the State's umbrella organisation for transportation of cargo in the country. Its subsidiary, Rail Combi owns the bulk of the purpose-built wagons. When faced with a shortage or additional requirements, it can lease more wagons from the parent company or from outside market.

Further, nature and capacity of tracks also affect the overall cost calculations. Different rates of tax apply for the use of tracks on different routes. As mentioned above, Rail Combi has a fixed

inventory of drivers at its disposal that is barely sufficient for its normal requirements. These drivers remain the employees of, and on the pay roll of, Green Cargo. To run extra trains and provide additional service, Rail Combi has to request for the release of extra drivers, which is a matter of Green Cargo's choice to accord it, or not.

My concluding impression here is that knowledge of, and access to, real cost figures is one thing and creating an order out of them to form a basis for a price tag on service is another. My respondent also was unwilling to discuss the cost situation in more than general terms. Looking at the available situation, one is forced to conclude that this is not an ideal basis for putting a price on the provision of service.

8.5.1.4 Cost as a Basis for Price-Setting?

Obviously then the next logical question is what is the basis of price-setting? Contrary to the world of theory, the practical world is a bit different. Estimates of incurred cost or potential cost do play a substantial part in price setting, (nevertheless), but some other extraneous, non-cost-based variable are also important. Depending upon a particular situation one variable may get priority over the rest but at face value they seem to have equal weightage in terms of importance or significance. A list of these variables is like this:

- Competition with road mode
- Haulage distance
- Demand balance on the particular section of traffic or route
- Traffic intensity and availability of track on a particular route

Although Rail Combi operates under a monopoly situation, it also has an obligation towards society to serve, which it takes very seriously in its business economics considerations. This obligation in certain sense means that it cannot refuse to serve a customer solely due to a price disagreement.

Consideration of above variables sometimes entails loss on a particular transaction, which has to be offset by a proportional additional gain on some other business deal. This per se is an additional variable in setting price. Taking the whole picture, in the words of Mr. Thunborg, it is safe to conclude that

"Actual cost has very little to do with price-setting".

9 DISCUSSION AND ANALYSIS

As is evident from the text in previous pages, the approach towards this study and research has been that of process mapping of the system, activities and operations. Now the output of this exercise will be put to discussion through mapping analysis in this chapter. The discussion is aimed more at integrating the views on individual topics to give a holistic rounding to the findings and reach a unified solution. There have though been attempts to broach the specific aspects of this project in previous pages.

A framework for this purpose was set in chapter third. Here the aim is to find the answers to the specific research questions posed earlier, not only quantitatively but more so in terms of qualitative issues attached to them. The discussion starts with assessing the need of a Land Bridge and accompanying advantages.

9.1THE NEED

Marketing slogans apart, POG really is a fairway port with easy access to open sea. It has excellent land connectivity. Matchless port infrastructure, at par service levels, throughput volumes and its geographic location distinguish it from other national ports. It also has feeder services operating from the region Another strong signal comes from the developments we gained insight into under Onyx Logistics Centre Case Study. A shift in focus and a branching out of the direction of the cargo flow in the event of reducing pressure on Stockholm can be safely bet upon.

Looking at the scale of its operations in proportion to its size, especially in comparison with other mainland European ports, the reality dawns that its potential is under-utilised. This scenario naturally calls for an extension in its hinterland beyond the usual

notions of national territory. From POG's market perspective, its customers are experienced; market per se is not growing, thus, the need to create a new business segment is only natural.

Looking for options in this regard and considering its location naturally bring Baltic Sea Region into focus. As I delved into the project, impression about the newness of this idea waned. It is only common sensical to think along these lines as some of the Baltic cargo is already crossing the Swedish territory to Norway through Baltic Rail Express.

Sweden has one of the most excellent road transport infrastructures in the world. This provision can be utilised to establish a direct, operational and permanent modal land-link that will act as a 'Land Bridge' between east and west coasts of Sweden for the sea borne cargo in waters on either side of the country. This Land Bridge can connect POG to "its natural hinterland". Therefore, there is sufficient reason to believe that the need, direction and focus all are genuine.

This guides the discussion to the question of viability of this modal land-link, which I will explore in next sections.

9.2 VIABILITY OF THE IDEA

There are at least two sides to it: functional and economic. I shall address both of them in separate sections.

9.2.1Economic Viability

The economic viability of service on a Land Bridge cannot be evaluated in isolation, at least, from POG' perspective, though an independent study by Rail Combi considering its investments and other costs may be possible. For POG, it can be done only in relative terms by comparing the land transiting cost to other available alternative(s). This is what the whole project consisting of three separate and independent yet integrative studies is all about. But still some aspects of it are alluded to in the following lines.

The idea of land transiting of sea-born cargo in waters on either side of the country has now been around for fairly a long time.

Opinions regarding this vary. But consensus in the industry puts it more than six years old. Yet no known effort were made to explore it the way this study does. The longevity of the idea per se indicates a certain strength about its economic potential.

Dominant opinion expressed in the industry regarding the economic viability is that POG must be able to attract 2-3 more big Trans-ocean shipping lines to call on it. But this seems a Catch-22 situation. Big lines will come only after the business or more precisely if the demand in terms of large volumes is there. And to create or give impetus to the creation of that demand, these lines must call on POG. Currently, only Maersk-Sealand, Atlantic Container Line (ACL), Wallenius Wilhelmsen and Eimskip call on POG. First two are really big players in trans-ocean shipping with diversified port coverage around the world. The other two are though deep-sea lines but they are more of niche operators.

The foregoing discussion only goes to underline the obvious. And that is: availability of adequate and reliable Lo-Lo and Ro-Ro traffic volumes will form the basic block of this viability. Profit potential of these volumes will be a big incentive in attracting all the operators in delivery chain into co-operation and action. Vigorous marketing efforts directed at shippers and forwarders at the start of the chain on one side and negotiating with big lines regarding their minimum volume requirements on the other should be the aim.

So, the qualitative issue in this regard concerns taking some concrete initiative. Volumes' identification issue is being addressed and taken care of in the first thesis of the series. Combined results of these efforts will help solve the dilemma stated above to a certain extent.

Here, one idea could be to judge this viability by simulating the reality with assumed inputs in certain different hypothetical scenarios. But as this study lacks the complete perspective and is only a link in the entire transport chain as explained before, therefore, doing this will be of little value at this stage. It may make sense when the results of all three studies are available and integrated.

Some independent cost figures or their estimates are, however, given to have an idea what the service by each mode on the Land Bridge will cost.

9.2.2 Functional Viability

In this section, discussion regarding the functional viability of the proposed Land Bridge and provision of service over it is presented. Theoretical framework of combined transport, modified and developed for the purpose of this study and elaborated later on in the chapter four, will be applied and guide the discussion about functional evaluation.

It has been found that conditions and infrastructure exist to form a Land Bridge between both coasts of the country. Service by both land modes is viable over it, though there are some definite doubts about the road transportation mode's ability to compete effectively. There are also some cost concerns in the case of both land modes, which might affect this viability and the ability of the Land Bridge as an alternative to compete effectively with other alternatives. These dimensions are discussed in the next sections.

9.2.3 Evaluation of Both Land Modes

Factors working against the road mode in this project are that it is unsuitable for the transportation of large volumes. To make service available for such large volumes over long distance and increasing operational cost associated with it will not be a very good use of money when the distance of either link is more than 300 km. Thus, the prime reason for lack of feasibility in case of the road mode has been found as being long transit distances for both routes.

Other big negative factors will be environmental concerns and increased congestion on the roads if one is willing to make the assumption that a consortium of big road hauliers will be willing to make a joint bid for service availability. Still more the price concerns will also discount this thinking in view of complex price setting mechanism in the industry.

High costs of transportation calculated on round trip basis, as is the norm in this business, which seems exorbitant when considered as one way costs, is the other reason. These arguments effectively discount this mode from consideration and further discussion. This leaves the rail mode as the only feasible alternative.

In the chapter about rail link, it has been found that Swedish Rail's daughter company Rail Combi has the know-how, facilities and equipment to provide service on the bridge. A functional precedent in the form of "The Baltic Rail Express" also exists. Rail Combi already operates this service for transit cargo coming from Finland and BSRR and meant for Norwegian distribution. Drawing parallels and common denominators between this and service on proposed Land Bridge could be a starting point.

There are some cost concerns about this mode as well but may not be as threatening as are in the case of road transportation. The probable cost ranges has been stated previously. Upper values in these ranges are as high as SEK 3000 and 2500 for both links while the lower values are not that low. There are reasons to argue for considerable downward adjustments in these cost figures. I will briefly touch upon four of them here.

9.2.4 Cost Reduction Potential

The costs of service in the previous section are not quoted for the fastest or in a certain sense shortest link that may exist among our target nodes. Going through Hassleholm on the Karlhamn-Göteborg link is an example. This can also be the case for Oxelösund-Göteborg link. But this is understandable because the system is not running. An efficient link, therefore, can be expected to offer reduced service costs.

Co-ordination of operations is another way of achieving optimal efficiency. Once Combi service starts on the Land Bridge, a co-ordinated effort among parties in the transport chain and fine tuned service production will also ultimately reduce these quoted costs.

Confidence expressed in BSRR's economic future, the reason de´taire behind this project, is another potentially very strong signal that future growth rate of cargo flows will be substantial. It will not only help achieve economies of scale in service production process but also thereby reduce cost to customers.

The last, but in no way the least, argument comes from experience curve theory. Any pioneer activity, especially involving complex operations, is characterised by high costs in the initial phases that tend to reduce over time because it holds significant potential for future efficiency improvements. Relationship between production process and production experience under straightforward assumptions has always been found positive. This precisely is the essence of so-called experience curve theory. Combi service production efficiency over Land Bridge is, thus, expected to improve by the length of its experience.

9.3 QUALITY OF PROPOSED SERVICE

The discussion about service variables should naturally start with service availability. Currently direct and/or dedicated rail combi service is not available either from Oxelösund or from Karlhamn to Göteborg. Track links among these three points currently exist that can be used and modified I have already elaborated on this aspect in the chapter entitled Possible Locations on the East Coast.

Next logical variable to be considered in this regard is the frequency of cargo transportation service over the Land Bridge. This to a great extent is a function of flow volumes to be served. But in any case, to make this alternative feasible, there must be sufficient volume to fill at least one train daily and a train can carry from 50 to 60 TEUs depending upon the combination of RoRo and containers loaded on it.

Perhaps the most important among the required service attributes that will determine the competitiveness of this alternative is the cargo transportation service throughput time. In this respect, the defining and determining influence comes from competing alternatives' service attributes provided at given costs.

Our third quality criterion defined as demand on the system is service reliability over the Land Bridge between the two coasts. It is also referred to and defined as regularity of service in the literature. Its importance is signified by the demands by different actors who own, or make possible this, flow.

9.3.1Some Other Perspectives

Service quality attributes have hitherto been considered only from shippers/forwarders' perspective based on the cliché that the customer is king. There are still other important actors, especially in the actual transport chain like shipping lines, ports hauliers, Rail Combi and consignees. Therefore, other actors' perspectives are also important and should be looked into while determining level of service. Some thoughts and opinions regarding this are presented next.

For customers the time schedule and frequency are relatively important. Experts in the field have opined from their experience that customers in this business like to build relationships and dependable systems, which could provide them with certainty and reliability in the service offered. A haulier or rail operator will give priority to sufficient and continuous availability of volumes over a long period over other less important service attributes.

Finally, for the port, their time management of internal operations, capacity, preparedness to handling activity will be crucial for performance and profitability. But above all, if given a choice, it "will like flexibility in scheduling the arrivals and departure of the trains", remarks Mr. Sundmark. However, an authoritative opinion about shippers' perspective, comes from Mr. Eric Nilsson, Marketing Director POG. In his view, they demand in order of preference[28]:

- Reliability
- Frequency

[28] In a briefing about this project at Port's head office on 10th of Sept. 2001.

- Cost-efficiency
- Adaptability

Continuing his argument, he further elaborated that

"Major part of the cargo from this region is already transit cargo. More transit points mean more cost to shipper due to increased handling and time-dependent costs"[29].

This is understandable. Hence, this study and its major thrust towards cutting both cost and service time. One way to realise these benefits is a functioning Land Bridge. The four variables enumerated by him above may be categorised as primary and secondary variables. The variables directly related to cargo flow and service on Land Bridge can be considered as primary variables. First three in his list fall into this category. The last one, i.e. adaptability relates more to a port own internal operational capability, therefore can be regarded as secondary from cargo flow service standpoint.

All the primary variable have been discussed at length in this study while the secondary variable is considered to be out of the ambit of this study, though Mr. Nilsson mentioned adaptability as one of the main strengths of POG.

9.4 MISCELLANEOUS FACTORS

It is almost certain that from a transit perspective, the nature of cargo in load carriers and their respective destinations will have a heavy impact upon the system in determining operational characteristics and quality of service over Land Bridge. This cannot be foreseen at the moment and is only a function of actual experience.

Further, cargo from BSRR is characterised by an imbalance between large volumes of low value exports and fewer high value imports. Patterns of flow destinations will also be a significant factor as only transit units have been focused in this study but all the cargo flowing through this channel will not be transit cargo. There must be some part of it meant for Nordic distribution.

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[29] Ibid

How the transit nature of Ro-Ro or trailer traffic especially destined to the UK and beyond will be characterised is also unclear at the moment. Will they be booked for a complete voyage? And what if the accompanying drivers preferred to drive themselves over the Land Bridge instead of using the provided Combi service? Questions like these will certainly have complicating implications for the system.

It has aggressively been argued in previous pages and pointed out time and again by the respondents in my discussions with them that for the success of this alternative reliable throughput service time is very crucial. When asked to make cost-service trade-offs, POG is reluctant to choose between service time and cost. It will prefer to have both: cost efficiency and reliable service time when making inter-port (referred to competitors here) evaluation; and lower service time when making comparisons among the alternative being pursued in this study project.

At the end of this section it seems only fair to say that there might be some other operational factors that might impose certain genuine limitations on the service production system over the Land Bridge with regard to the quality.

9.5 MANAGEMENT ASPECT

In this section I shall try to discuss the practicalities of making actual service over Land Bridge possible, i.e. continuity of flow through the transport chain. Precision is one word that readily come to mind in this regard. Precision in co-ordination, timing and service operations!

This line of thinking brings management aspect into focus, which assumes a whole new significance for the success of the idea. Co-ordination among chain partners regarding vessel arrival and departure, without-delay transhipment in port terminals and Combi operations is of especial importance. For example, arrival/departure of train should be arranged to match as precisely as possible with arrival/ departures of the vessels preferably at both coasts if impossible then at least at the East Coast. This will ensure and realise maximum benefits for the use

of inter-modality in Trans-ocean shipping, as its operational aspect will come into play.

Complexity will further increase in view of large volumes, capital tied-up and various actors with differing and varying degrees of interests. This has to be balanced against and made to fit with other corporate interests of the individual chain partners as the underlying assumption here is that the service production for Land Bridge will be accorded the highest priority by all chain partners. In short, co-ordination of flow and transhipment activities will underpin the success for Land Bridge's role in Trans-ocean shipping. How this co-ordination should or can be managed, we discuss in next section.

9.5.1Service Co-ordination

Jensen in his groundbreaking study on combined transport provides a framework for this purpose, too[30]. I have tried to apply it here with certain modifications.

A use of combined transport of the type being studied in this project will mean that POG, Green Cargo or its daughter company Rail Combi, selected ports on the east coast, shippers and forwarders must co-operate in the proposed system which necessitates co-ordination. The co-ordination function will involve following primary tasks:

- Market analysis and marketing with the aim of creating optimal volumes
- Volume consolidation, especially at the East Coast to facilitate fixed train quantities.
- Development and organisation of combined transport on Land Bridge
- Overall co-ordination of the production plans of all transport chain partners
- *"Overall quality surveillance and quality control"*

[30] Jensen, Arne, 1990, *Combined Transport – Systems, Economics and Strategies*, p 383 f

These tasks are crucial and must be attended to with clear responsibility focus. Someone in the chain must assume leadership position in this regard. The one with the biggest stake, and position to back it up with all means, should be the natural selection. System improvements cannot be imagined at this moment. Once the system is in place then there will be room for it. The chain leader will also be required to take care of this dimension.

It will be in the interest of all the actors, at least in this country, to think strategically, engage in an open and mutually beneficial dialogue to realise the great potential in the offing. Another incentive to do so is their shared customer base. They all serve or strive to serve same customers. Then why not do it in a better and co-ordinated way with joint efforts and pooled resources. After the initiation of this idea into practice, a starting point in this direction could be a computerised cargo flow management system. These and other similar strategies are being pursued successfully in other delivery chains. And this will constitute a real challenge for all the partners in cargo flow chain.

10 CONCLUSIONS

The view taken to reach the conclusion, at least in this subproject, may have been biased in the sense that while defining a perspective, service variable of lead or throughput time and cost variable of cost per cargo carrying unit in the transport chain have always got preference over the rest. A case regarding this preference or bias has been made elsewhere in this report. With this prelude, this chapter will try to summarise the discussions made in previous chapters particularly in the ninth chapter and draw some definite conclusions. For this we follow the specific research questions defined in chapter three.

10.1 LOCATIONS ON THE EAST COAST

My first research question was about the possible/potential locations on the East Coast of Sweden. It has been amply demonstrated in chapter five that for the purpose of this project, Karlshamn and Oxelösund are two most attractive locations considering the pre-set criteria. Rail Combi has shown its interest in the former and has indicated to start a Combi service on a short notice.

The overriding cost and service variables in the determination of these locations were capacity, cost of service and service throughput time in ports.

10.2 COST AND SERVICE VARIABLES

Taking up the next question that is about cost and service variables, leads the discussion into the operational aspect of the study. Foremost cost variable defined was the total one-way service cost over the Land Bridge as cost per TEU. This cost is the sum of two components: transportation cost and terminal handling cost at both ends.

Among the service variables, considered most important and relevant, are service time and reliability / regularity of service. Both these variables are taken as independent of the transport chain, though both have an added significance in the broader perspective as well. Service time along with cost of service shall be the defining criteria when it comes to the evaluation of competing alternatives' comparative advantages. Further discussion in this respect is presented in the next section.

10.3 Availability of Service Infrastructures

Investigation of infrastructure links for the proposed Land Bridge reveals that both the selected locations on East Coast have excellent road connectivity till and with POG. But this mode has been found lacking in competitive characteristics. Rail links also exist amongst all three nodes though these might not always be the most efficient or direct links.

An efficient link here means having a potential for optimal cost and transport time. This is especially true in case of Karlshamn-Göteborg link. Immediate service if commissioned will be available through Hässleholm, which is not the shortest or fastest link. Completion of the southern rail link will reduce distance on this link significantly and consequently service time and cost also. Besides, there are other on-going projects as mentioned in chapter five that will further fortify rail links amongst the selected nodes. It is, however, a matter of time to plan service provision on the two routes by Rail Combi.

Another aspect regarding availability of infrastructure is that transhipment of load carriers onto rail wagons at terminals will be handled by port. Port of Oxelösund currently lacks this capability, therefore, does not handle container traffic at the moment. However, it has plans to build this, once future developments satisfy its market projections. This leaves only Karlhamn-Göteborg route of the bridge as a possibility in immediate future.

10.4 POTENTIAL COSTS AND SERVICE TIMES

The answer to the last research question that is about potential costs and service throughput times for each link and mode, indicates that a round trip road haulage between Oxelösund and Göteborg over a distance of 772 km @ SEK 8 per km will cost SEK 6176. While it will be SEK 5160 per 40´or 2 TEUs for Karlshamn-Göteborg link over a distance of 645 km. But if a perfect transport demand in both directions exists, then this cost will be halved for one way otherwise it will be equal to a round trip. One way transport time will be 5 hours and 30 minutes, and 4 hours and 36 minutes respectively for both links. But this mode has not been found competitive.

For the other mode, we have a quoted figure for all types of units that can give a reasonable idea of what the actual cost will be when the system will be running with complete efficiency. Safely estimated cost of haulage by rail of one unit of any type between Oxelösund and Göteborg will be from SEK 2500 to 3000. For the other route, it will be between SEK 2200 to 2500. However, on the basis of argument developed in previous chapter, the most likely cost figure is expected to be the lower one. Thus, the total one way landed cost of one 40´ container or trailer on either coast over the Land Bridge part of the chain will be SEK 2785 for the Karlshamn-Göteborg link. For the Oxelösund-Göteborg link of the bridge, most likely landed cost per 40´contaier SEK 3625 while for a 20´ container and trailer it will be SEK 3325 and 3100 respectively.

Calculated throughput service time figures over the bridge are relatively less complicated. Again on the basis of reasoning in chapter nine, I have taken the mean values of quoted range as the most likely service time. For the terminal component of the service time, it has been agreed at one hour and 30 minutes for the single activity of either loading or discharging after hotly contested argument with respective respondents at the terminals involved in the study. For terminal handling at both ends of the bridge, it is 3 hours.

Therefore, landed one way service throughput time of any load carrier by rail combi in either direction for the K-G link is 12 hours while 10 hours and 30 minutes for the O-G link. In the absence of a given or quoted time for transhipment at Oxelösund, I have assumed the same handling time for it as that of in Karlshamn. The reason for the assumption is that Oxelösund's size, capacity and other conditions are likely to be more akin to those of Karlshamn rather than those of Göteborg.

10.5 Conclusions and General Observations

Karlshamn and Oxelösund are the two most appropriate locations for this alternative on the East Coast. Karlshamn is a functioning facility though it needs further improvements and developments in future. A connection can be established to start a service on an experimental basis in near future that can serve as a strategic springboard for this idea.

At the moment dedicated or route based road cargo haulage service does not exist on either of the routes. Neither it seems feasible and competitive in view of the long route distances on either route. Direct train link is also missing on both routes. Rail Combi does not have any terminal on either of the locations on East Coast.

But this does not in any case mean that it is not feasible. It is feasible (please note two different words are being used in the discussion part; viable and feasible) as Rail Combi experience has shown in the case of Baltic Rail Express. Needed are assurance of reliable and continuous volume, a concerted effort on the part of major stakeholders and adequate time for planning and implementation.

Common sense tells us that successful alternative must have significant cost advantage over the competing ones. POG is confident that, all else being equal, it could attract and win customers on the basis of better customer service over the competing ports in the region. Here its being flexible is key to

this criterion. It is the stated objective at POG that among service variables, priority will be given to being flexible.

The overwhelmingly shared opinion is that this idea is definitely viable and this study has also shown its viability at least on chosen variables of throughput time and cost. The need of the moment is to get down to the basics instead of political talk. Real actors should engage in an open, multi-party dialogue, get involved and come together with concrete proposals.

A similar kind of arrangements is already in place and working. There is no reason to believe that why this cannot work in the case of this idea. What POG needs to evaluate and do is to conduct a study on how big ocean lines can be persuaded to call there. For this shippers, forwarders and to some extent consignees should be the target of marketing efforts needed to convince them to route their cargo though POG.

10.6 SOME REFLECTIONS ABOUT THE STUDY

At the outset of this study, it was presumed that some particular routes will be specified. This proved to be wrong during the course of the research. Routes to Rail Combi or to hauliers for that matter cannot be dictated if they are to become willing partners in this project. They will choose according to their own preferences based largely on business economics considerations. Fortunately, this did not prove to be a stumbling block and infrastructure exists to form links. After links formation, functionality of the proposed Land Bridge, though never doubtful, was the next big issue. Investigations into this aspect were stimulating and have only enhanced the learning process and insight.

There have been doubts voiced over Rail Combi's capacity to serve large volume by a feeder vessel operator, Team Lines[31].

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[31] Interview with Karl-Reidar Gundersen Managing Director Team Lines, by Claes and Marina on 2001-09-06. For complete reference please see Kristenson, & Erlandsson (2002)

While its ire is understandable as the success of Land Bridge will knoll a death bell to its business in this segment, we have an unqualified assurance from Rail Combi that any level of volumes will be, in Mr. Thunborg's words, "no problem at all".

My last reflection is about potential future supply scenarios crossing the Baltic Sea about which the feeder vessel operator has also tried to cast some doubts[32]. This view cannot stand reason. The work on this study speaks with ample confidence that these can only go in one direction and that is up!

10.7 FURTHER RESEARCH

During the course of research on this study, some areas became conspicuous due to the dearth of information and knowledge. Further investigation into those aspects shall only boost the confidence in the potential of this idea as an attractive business opportunity.

Further work is suggested into motivating factors for big ocean shipping lines that attract them to select a port for call. Another variation in this regard could be to investigate the calling cost at POG for big shipping lines and then analysing it in comparison with the assured/concrete volume levels POG can offer considering its existing and potential hinterland. This is essentially a cost-benefits analysis for a port of call from an ocean liner's perspective.

If the above suggestion pertains to the end of the Trans-ocean transport chain, then another area found worthy of exploring relates to the start of the chain. I found absence of first hand knowledge or survey backed research into shippers' and/or forwarders' decision making criteria when choosing shipping flow/route or line for transportation of their load carriers lacking, particularly in this segment of the shipping market.

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[32] Ibid.

Research into shippers/forwarders preferences shipping carriers and its impact on Liners' calling destinations could be of much interest for informed decision making in this regard.

Appendix – 1

Interview Guide – Road Transportation

A brief profile of the company……..

Does your company offer service for haulage of cargo carriers to and from East Coast to port of Göteborg?

Which route(s) does your company serve?

Have you ever thought about the possibility of BSSR cargo passing through Sweden? What is your opinion?

What are the possible routes if this idea has to be viable?

What is your proposed or preferred route?

Your reasons/motivation for this route……..

Service quality dimensions: Service availability, frequency, state of road congestion, competition

What are the distances for Oxelösund and Karlshamn from Göteborg?

What is the normal one-way service time (from Göteborg to Oxelösund and to Karlshamn)?

Is it possible to reduce this service time? If yes, how?

What are the critical elements or operational characteristics and activities that are important from the point of view of offering cargo transportation service?

How does your company define or express carrying cost (in terms of unit)?

What types of unit cost does your company use as a basis to charge for its service?

What is the cost per unit for this route?

What component costs are included in the calculation of this unit cost?

What service output level (throughput units) your company is capable of offering in the event of this idea becoming a reality?

What is your overall advice in relation to this idea?

Any other suggestion or thing you will like to say/discuss…

Interview Guide – Rail Transportation

A brief profile of the company……..

Does your company offer service for haulage of cargo carriers to and from East Coast to port of Göteborg?

Which route(s) does your company serve?

Have you ever thought about the possibility of BSSR cargo passing through Sweden? What is your opinion?

What are the possible routes if this idea has to be viable?

What will be your proposed or preferred route?

Your reasons/motivation for this route……..

Service quality dimensions: Service availability, frequency, and competition

What is the current one-way service time (from Göteborg to Oxelösund and to Karlshamn)?

Is it possible to reduce this service time? If yes, how?

What are the critical elements or operational characteristics and activities that are important from the point of view of offering cargo transportation service?

How does your company define or express carrying cost (in terms of unit)?

What types of unit cost does your company use as a basis to charge for its service?

What is the cost per unit for this route?

What component costs are included in the calculation of this unit cost?

What service output level (throughput units) your company is capable of offering in the event of this idea becoming a reality?

Do you think road mode can compete with rail? If yes, over what distance?

What are Rail Combi's terminal handling costs?

What do you think how much time will be required for preparations to launch a full combi service on the proposed links?

What is your overall advice in connection with this idea?

Any other suggestion or thing you will like to say/discuss…

Interview Guide – Port Terminal Operations

An overview of unitized cargo terminal operations

Details of activities that are performed to discharge and load containers and trailer within the terminal from arrival till departure of the cargo from the terminal

Is the operational treatment same for both modes (road and rail)? If no, what are the differences?

Actual cost figures for each activity (or estimation thereof or guidance to the source of such info)

What service variables are IMPORTANT from a perspective of quality of service to the success of whole idea (especially considering the Land Bridge alternative) and what are Port of Göteborg (POG)'s PREFERENCES/priorities?

What is POG's preference between cost efficiency and service quality within the framework of this Land Bridge alternative?

What operational activities/characteristics are crucial to underpin the success of whole idea the achievement of preferred service variables, especially during Trans-shipment and/or cargo handling during the entire flow?

POG's idea of preferred location on the East Coast and motivation/ reason(s) for the preference(s), views about Norrköping, Oxelösund and Karlshamn

Need reference or contact within cargo hauliers and shipping lines for interviews, especially in Green Cargo

Any suggestion from your side to add more value to the exercise, especially regarding any potentially useful source of info

What is your advice/guidance as our company supervisor regarding the completion of this subproject?

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