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THE POTENTIAL FOR WATER FREIGHT IN THE SOUTH WEST UK

by

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ABSTRACT

The potential for water freight in the South West UK

The role of water freight as a sustainable mode of transportation often receives special attention in logistics and transportation. Due to rising environmental concerns UK national policy supports an increase in the amount of freight movements on commercial waterways. Within this context this research investigates the potential for water freight in the South West (SW) UK especially in Cornwall and Devon (CAD).

This study is exploratory and following literature searches Delphi methods were selected with which to gather primary data. The research required three rounds of Delphi surveys. Following this, a focus group with the members of the 'Maritime and Waterborne Innovation Group' in the SW UK was conducted to measure the trustworthiness of the Delphi findings. The Delphi study achieved consensus on eight statements. Results indicated that the presence of an extensive coast line with accessibility to several coastal ports is conducive to the effective management of water freight movements in the region. The focus group discussion provided fuller explanations, suggestions and statements of issues which require further exploration for the development of water freight.

This study reveals the latest information and possibilities and helped to articulate the importance of using water freight in SW UK. The results of this research also have many implications for the rest of the world where water freight is either in its infancy or aiming to increase its usage. The suggestions, observations and information collected during the Delphi study and from the focus group participants will assist in formulating strategies to improve the efficiency and effectiveness of water transportation within a region or a country.

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LIST OF ABBREVIATIONS

ABBREVIATIONS	FULL WORDS
ABP-	Associated British Ports
B-	Billion
CAD-	Cornwall and Devon
CILT-	Chartered Institute of Logistics and Transport
CO2-	Carbon Dioxide
DFT-	Department for Transport
EC-	European Commission
ECA-	Emission Control Area
EIB-	European Investment Bank
EU-	European Union
GDP-	Gross Domestic Product
GHSs-	Greenhouse Gases
FFGs-	Freight Facilities Grants
HGV-	Heavy Goods Vehicle
HMT-	Harbour Maintenance Tax
ICD-	Inland Container Depot
IMO-	International Maritime Organization
IWT-	Inland Water Transportation
K-	Thousand
Km-	Kilometres
LO-LO-	Lift-on/lift-off
m-	metre
M-	Million
MDO-	Marine Diesel Oil
MGO-	Marine Gas Oil
MOU-	Memorandum of Understanding

MTS-	Marine Transportation System
RIS-	River Information System
RO-RO-	Roll-On/Roll-Off
SPC-	Short Seas Promotion Centres
SSS-	Short Sea Shipping
SWRPA-	South West Regional Port Association
SW UK-	South West UK
TEU-	Twenty Foot Equivalent Unit
TEN-T-	The Trans-European Networks
UK-	United Kingdom
UNECE-	United Nations Economic Commission for Europe
USA-	United States of America

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AUTHOR'S DECLARATION

At no time during the registration for the degree of Doctor of Philosophy has the author been registered for any other University award without prior agreement of the Doctoral College Quality Sub-Committee.

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Chapter 1. Introduction

The importance of water freight as a sustainable mode of transport is growing. As world trade depends on maritime transport, water transportation has a special place in the logistics industry. This study analyses the potential for water freight in the South West UK (SW UK) especially in Cornwall and Devon (CAD). The benefits of using water freight differentiate it from other modes of transportation such as road, rail and air (BVB, 2009). The current scenario reveals that road transport is mostly used for domestic transportation of goods (Sea and Water, 2008). From the literature review it was understood that many countries (EU, USA, Australia etc.) are using water freight for inland shipping, coastal shipping and short sea shipping. Today in the UK the use of water freight is limited compared to the EU and USA. The increased use of water freight in the UK is dependent on the willingness of business and government to embrace a modal shift. The benefits of water freight can encourage a modal shift and include improved energy efficiency, reduced pollution, less highway congestion, improved road safety, and lower infrastructure expenditure, increased vessel and slot utilisation and ports throughput (UNECE, 2011).

Water freight has all the above-mentioned merits, however the decision to use a mode of transport depends on the reliability of the mode. According to Sea and Water (2008) although logistics decisions are based on economic factors of an operation, reliability is considered more important than basic cost. A reliable service offered at reasonable cost is the preferred mode. Water transportation is a sustainable mode of transport in a supply chain. The integration of water freight into intermodal transportation and logistics increases the efficiency and competitiveness of the freight transport industry while keeping the environmental balance (Tailor, 1993). There are many challenges that block the potential of water transportation in using it as a mode of transport. Lack of government policy to develop waterway systems, shortage of government incentives, increased rates in ports, fleets with aged vessels, the need for more modern equipment in ports, and new investments for the integration of the transport logistics chain (Valois et al, 2011) competition from different national rail firms seeking to maximize the usage of

their own national networks, poor regulation and management, (Wood, 2004) are some of the challenges.

Society benefits greatly from water transportation. Water freight offers many environment-related benefits. By using water transport, the quality of life in a society will be improved. Studies (UNECE, 2001; EC, 2013; European Communities, 2006) from the European Union (EU) have proved that the social benefits of using water transportation can be significant. To reduce the amount of carbon dioxide and the effect of greenhouse gases, the UK government is trying to promote the use of water freight wherever possible (IWA, 2012). The government also offers Freight Facility Grants to encourage companies to shift their mode of transport to water freight. The use of water transport offers many financial advantages to the local economy. A regular and continuous water shipment in a port encourages developing the related businesses in that area to support proper functioning of the port. This will directly or indirectly benefit the local economy (Yassin et al, 2010).

1.1 Research Background

The research analyses the nature of water freight in the SW UK. There are 41 ports in the SW UK. A majority of these concentrate on fishing and waterside leisure activities. Among them six major ports are commercially active in CAD. These two counties are famous for their maritime activities. Ports, harbours and rivers in CAD play an important role in transportation of goods, services and passengers around the coast and to destinations within the UK and out of it (Cornwall Council, 2012). Many ships regularly export and import goods using these ports. The major cargo items of import and export include refined clean oil products, agribulks, timber, specialist aggregates, primary/secondary aggregates, china clay, grains, and scrap metal. This study investigates general attitudes towards water freight transport in CAD, current practices in the water freight, the importance of water as a mode of transport in the supply chain, the potential of water freight from a business point of view, and barriers to achieving this potential. At the same time, the researcher tries to identify whether the use of water freight as a mode of transportation is worthwhile to the logistics industry in CAD. The benefits of using water freight as a mode of

transport are also examined. The research highlights the official, technological, legal, monetary, administrative areas and the geographical uniqueness of CAD to examine challenges faced by the logistics industry in using water freight as a major mode of transport. By collecting opinion from the experts of different areas related to water freight, social and economic developments with implications for CAD are identified. From all these activities, this study ultimately tries to find out whether solutions for water freight as an efficient and sustainable mode of transport in CAD can be developed and if so, implemented.

1.2 Research Objectives

The overall aim of the research is to investigate the current status, challenges and solutions in developing water freight in CAD. By investigating the potential for water freight in the SW UK, the main aims and objectives of the research were

1 To examine the nature of water freight in SW UK, especially in CAD

2 To evaluate the contributions, that water freight could make to the logistics industry in SW UK

3 To synthesise the challenges blocking potential logistics companies in using water freight as their modes of transportation

4 To assess the socio-economic impact of water freight

5 From the above objectives, to evaluate the managerial solutions in developing water freight as an efficient and sustainable mode of transport in SW UK.

The key research question was:

What is the potential for water freight in the SW UK?

1.3 Methodology

This study is exploratory research. A conceptual model was formed based on a literature concerning the potential for water freight in the SW UK and objectives of the research. The conceptual model identified the people (stakeholders, professionals in the shipping and logistics industry, etc.), and the things or official documents/policies (port infrastructure, hinterland connections, tax incentives, etc.) which are influential in developing water freight in the SW UK. These key factors and their assumed interrelationships are important for the analysis of the research problem. The experts' opinions on the key factors and their connections helped the researcher to analyse the situation without any pre-set views. The best approach to find the experts' information on the impact of key factors and their expected interactions is indicated in the conceptual model and in the Delphi method. Consequently, the research uses a qualitative approach known as the Delphi method and secondary research for data collection. Secondary research is mainly the review of literature. A detailed literature review is the basis of this study. Thus, a proper understanding of the current status, future opportunities and obstacles to water freight is realized.

The Delphi method was used for primary data collection. It uses recursive rounds of sequential surveys interspersed with controlled feedback reports and the interpretation of experts' opinion to organize conflicting values and experiences into consensus (Donohoe et al, 2012). It allows a group of individuals to express their opinion on a complex issue. By using a series of intensive questionnaires with controlled feedback the researcher reaches the most reliable consensus from a group of experts. The selection of experts and their knowledge and experience of the research problem determines the success of the Delphi method. All the participants in the Delphi method are anonymous to each other but not to the researcher. This allows the researcher to follow-up each respondent when any problem arises between rounds.

Usually the consensus is reached within two to three rounds of the Delphi survey. This research conducted three rounds of survey to reach a consensus

on the different issues related to water freight in CAD. The first round was supplied through a questionnaire with an intention to collect mostly qualitative data from the respondents. The second and third questionnaire were prepared based on the information collected from the previous questionnaires. The participants in an expert panel were selected from different stakeholders related to water freight.

A focus group with the members of the 'Maritime and Waterborne Innovation Group' in the SW UK was conducted to measure the trustworthiness of the Delphi findings on the potential for water freight in the SW UK. Establishing the methodological rigour of the Delphi study is a vital aspect of this research to produce dependable results. Focus group as a secondary method helps to provide an interpretative aid to research findings, a contextual basis for research methods, and to generate new insights into the early findings of the research (Bloor et al, 2001). The verification of Delphi findings clarifies and strengthen and help to gauge the generalizability or transferability of the findings (Hansson and Keeney, 2011).

An analysis of inland water transportation, coastal shipping and short sea shipping and activities at the ports, was conducted. However, research into the current water freight movements in the ports in CAD - is hampered because most data is confidential. Other limitations include the availability of information, overcoming the physical gap in the distribution of ports, availability of statistics, time, port security, travelling to ports when needed to and the cost of doing it. To overcome the limitations, the area of the study is restricted to two counties in CAD which may not be wholly representative of other areas.

1.4 Research structure

This study consists of eight chapters. A short description of each chapter is given below. Chapter one gives an introduction of the study. It explains the research background, objectives, proposed methodology, and structure of the thesis. Chapter two consists of a literature review and starts with a general introduction to water freight, importance of water freight, water freight as a sustainable mode of transportation, its socio-economic impact, relationship to

the logistics industry and its challenges in Europe, the UK, the SW UK, major ports in CAD and finally identification of gaps in the available literature.

Chapter three explains the formation of a conceptual model based on the literature review and study objectives. The conceptual model informs selection of the research methodology. Chapter four discusses some theories of research methodologies to inform the collection of primary data, the selected method of data collection (the Delphi study), characteristics of the Delphi method, advantages and disadvantages of the Delphi method, conducting the Delphi rounds, reliability, validity and trustworthiness of the Delphi method, a comparison of the Delphi with traditional survey and a description of the Delphi method used in shipping and logistics research. The adoption of focus groups as a method of verification of the Delphi results is also discussed. Chapter five offers a detailed description of the process of conducting the three rounds of Delphi surveys, the development of survey questionnaires, how the data is collected, and the analysis of the results.

Chapter six provides an interpretation and discussion of the results of the Delphi surveys and conclusions based on the research objectives. Chapter seven displays the process of focus group discussion with the members of the Maritime and Waterborne Innovation Group, findings of the focus group and a discussion of it relation to Delphi results.

Chapter eight summarises the research conclusions including what the researcher found, what it told us, the implications for theory and industry, policies formed for the development of water freight in the SW UK, suggestions for further research, problems faced during the research, and suggestions to improve the ways of doing research.

This chapter gave a general introduction to the research, its purposes, and the ways of doing it. The next chapter provides a literature review about water freight and its importance in the world.

Chapter 2. The role of water freight in logistics: a review

This section reviews studies already conducted on the “Potential for Water freight in the SW UK”. The review includes work on water transportation from different parts of the world, Europe, the UK and from the SW UK. The review provides a building-block for creating further knowledge and understanding of the importance of water freight in an era of increasing environmental concern.

This chapter begins with a general introduction to water freight and its potential benefits, and then considers water freight as a sustainable mode of transportation, its socio-economic impact and its relationship to the logistics industry. The chapter considers water freight in Europe, water freight in the UK especially the SW, and challenges faced by water transportation in the UK before presenting a critical evaluation of the contribution of the relevant literature.

2.1 Water Freight

Water has been and remains a vital force in shaping the physical and economic development of many countries. Settlement patterns and industrial development naturally happened on the coasts and waterways because inland rivers and coastal routes were the primary transportation corridors. They provided access to marine resources and offered the only economically viable means of moving goods (AASHTO, 2013). According to Department of Transport (DFT) UK, domestic waterborne freight consists of “inland waters traffic carried by barge or sea-going vessels on the inland waterways network (rivers and canals), coastwise traffic carried around the coast from one UK port to another and one-port traffic to and from offshore locations such as oil rigs and sea dredging” (DFT, 2013). Waterborne transportation is non-ocean-going, moving commercial freight along coasts, sometimes including inland waterways called short sea shipping (SSS) (Zou et al, 2008). SSS is defined as any services which are not considered to be deep-sea-shipping (Rich, 1983).

It is believed that the first canal navigation in Britain began in Roman times. The two canals the Fossdyke and Cardyke built in this period, still remain. In 1566, the first truly commercial canal of the modern era was developed in the river at Exeter. The growth of Britain's navigable inland waterway system of canals and rivers for the movement of freight took place in the eighteenth and nineteenth centuries. Coastal shipping has always played an important role in the development of the UK. By 1750, several main rivers had been made navigable and about 1200 miles of river England were passable for barges carrying foods (Roger, 1979). The canal system built in the 18th century acted as the catalyst for the industrial revolution. From 1770 to 1830 the canal system quickly expanded to over 6,400km in length and provided an economic opportunity to transport goods to a larger market. Thus, in the UK water freight became the central mode of transport for 18th and 19th century haulage (Sea and Water, 2008).

However, with the rise of railways, waterways found it difficult to compete with the efficiency of the railway network capacity. Railways and road transport became the major modes for moving goods. Waterways declined rapidly after 1918 as modern road transport developed. Simultaneously, government prioritised rail modernization and improving road networks, and waterways continued to decline (defra, 2000). After 1945, the popularity of waterways grew and many neglected waterways have been restored to navigation. The two significant factors behind the renewed interest in waterborne transport are environmental concerns and a more generous government grant system to encourage business to seek alternatives from road transport (Geographical Magazine, 2001). Freight is moved on the broader canals and rivers in north-east England. The Kennet and Avon, Huddersfield Narrow, Rochdale and Forth and Clyde/Union canals have all recently been brought back into use, while a completely new waterway the Ribble Link has been constructed to connect the Lancaster Canal in North West England with the rest of the waterway system (Maeer and Millar, 2004).

The three distinct sectors of water freight: inland shipping, coastal shipping and SSS are explained below.

2.1.1 Inland shipping

Inland water transportation (IWT) is a sustainable and environmentally friendly mode of transportation in terms of energy consumption, noise and gas emissions. It offers an alternative which is competitive but complementary to other modes such as road and rail. Main inland waterways and smaller waterways have the potential to assist the movement of freight within the UK. The development of IWT is related to a limited number of economic activities such as the iron and steel industry, the chemical industry, the building industry, agriculture and seaports (Van Hulten, 1977). Navigable inland waterways offer a cost-effective means for moving major bulk commodities, such as grain, coal and petroleum. Inland navigation is a key component of state and local government economic development and job-creation efforts, and is essential in maintaining economic competitiveness and national security (US Army Corps of Engineers, 2014).

2.1.2 Coastal Shipping

Coastal shipping is defined by domestic traffic moving around the coastline (Rowlinson, 2009). In the UK coastal shipping comprises “all freight moved between ports in Great Britain, Northern Ireland, the Isle of Man and Channel Islands (traffic between a UK port and either the sea bed or off-shore installations)” (DFT, 2012). A European definition includes movements between ports in neighbouring countries as coastal shipping (ECMT, 1998). The most important task of coastal shipping is the transport of bulk cargo. Coastal shipping is an important component of the national transport task, carrying mostly heavy cargoes over long distances (Webb, 2004). Coastal shipping has a long history. Countries having an extensive coastline and many navigable rivers, became particularly reliant on coasters to move coal, grain, ore and a wide range of agricultural and extractive goods. Many of the industries are located on or near the coast, making coastal transport an obvious choice for domestic supply chain logistics.

Some logisticians are considering coastal shipping as an alternative to congested roads and rail links (Trade Winds, 2009). Coastal shipping may

offer one solution to road congestion and associated environmental issues (Bendall and Brooks, 2010). Movement of freight by coastal ship and integration of coastal shipping into the transport network could reduce the length of the land based transport modes and release the burden on them. Coastal shipping is the least polluting mode, has much higher energy efficiency, is secure and produces less CO2 per tonne carried (European Commission, 1999). Lower infrastructure costs, expansion of the transportation network capacity, port productivity improvement and improved corporate social responsibility are some of the other benefits (Denisis and Perakis, 2008).

2.1.3 Short sea shipping

SSS can be defined as the movement of domestic and international cargoes, containers and passengers by water along coastal routes and inland waterways (SKEMA, 2009). SSS acts as commercial waterborne transportation that does not travel across an ocean. It is an alternative form of commercial transportation that operates in inland and coastal waterways to move commercial freight from major domestic ports to its final destination (Lombardo, 2004). SSS involves short journeys that are time sensitive. The main aim of SSS is to support a modal shift from the congested roads to sea. SSS is a sustainable transport link in the door-to-door supply chain (European Commission, 2006). Environmental awareness, increasing freight transportation demand, and limited overland infrastructure supply, motivated the emergence and development of SSS (Zou and Smirti, 2008). Blonk ((1994) listed the advantages of SSS. It is cost effective with respect to investment and the resulting increase in transport capacity because it does not require expensive maintenance and construction. SSS can only prove viable if its operating costs are sufficiently low to enable pricing below overland shippers. In order to benefit from SSS it is appropriate to select stretches of sea between 650-800km, which thereby places SSS in direct competition with road freight movements. If the external costs are very high, the marginal social cost of alternative modes increases, SSS could therefore be competitive even for shorter distances (DFT, 2010). Successful SSS adds value to a national or international transportation network and thus improves economic efficiency and the social standard of living (Mulligan and Lombardo, 2006).

2. 2 Benefits of water freight

Water freight offers many advantages compared to other modes of transportation such as its inherent quality to protect the environment, low cost, energy efficiency, stimulations to the economy, social benefits, safety etc. (IWA, 2017; Mode Shift Centre, 2017). Many studies confirmed and proved advantages of using water freight. Water transport is considered to be more sustainable and economically competitive compared to road (Medda and Trujilo, 2010). Water freight offers a sustainable green alternative to road and rail, generating less CO2 per tkm (Carr, 2011). The European Commission has identified water transport as a key factor in economic progress and prosperity and an important source of revenue and employment (European Commission, 2013). In the United States, water transportation is considered as the safest, least polluting and most cost efficient of all freight transportation (HighBeam Business, 2014). A summary of water freight benefits is given below.

2.2.1 Environmental benefits

Nowadays the environmental effects of transport are receiving more attention. Consumers voice serious concerns regarding limited resources, global warming, and greenhouse gases (GHGs) (Prokesch, 2010). The development of water freight as sustainable transportation is motivated by environmental awareness, increasing freight transportation demand and limited overland infrastructure supply. According to Winebrake, et al (2008) sustainable transportation is the most effective using water freight and rail transport over long distances thus reducing the road time environmental and economic costs. Generally water transportation is away from the population centres, so the emissions from barges are less disturbing than other modes of transportation. Many studies recommended that water could be more sustainable and environmentally friendly than road haulage as it consumes less fossil fuel per tkm, produces less noxious emissions and less CO2 (Sauri and Turro, 2013). Whilst it is understood that the research conducted is not un-biased.

"Researchers at the Tyndall Centre for Climate Change Research have estimated that road freight produces 0.08t of carbon for every freight ktkm. This means that a move from road transport to water freight has the potential to save three quarters of the carbon involved in the transport of the same tonnage by road" (Inland Waterways Advisory Council, 2007: 24).

In this situation, the EU and the UK government have developed policies to support the transfer of goods to greener modes. A sustainable transportation system allows the basic access needs of individuals and society to be met safely and in a manner consistent with human and ecosystem health, and with equity within and between generations. It is affordable, operates efficiently, offers choice of transport mode, supports a vibrant economy, and limits emissions and waste within the planet's ability to absorb them, minimizes consumption of non-renewable resources to the sustainable yield level, reuses and recycles its components, and minimizes the use of land and the production of noise" (Centre for Sustainable Transportation, 2002, p: 2).

Hilling (1999) stated that water transport is the least damaging of the modes with respect to air and ground pollution, noise, vibration and visual intrusion and in terms of demand for finite resources of fuel, aggregates and land. The real cost in terms of pollution, climate change, noise and accidents are road €24 per 1000tonne km, rail €12 and water €5 (EU Roundtable, 1997).

West Midlands Freight Strategy 'Vision & Key Issues Consultation' (2013) says that the carbon emissions from water freight are low compared to road and rail freight, which are 63% lower than for road and 25% lower than for rail.

Mihic et al, (2011) found that water transport if conducted properly, does not threaten the environment; does not produce waste or pollution, and it does not harm the view of the landscape.

Kingsland Wines, supply wine and spirits to UK major multiple supermarkets and airlines. A barge service delivers containers to their bottling plant in Irlam, Greater Manchester through the Port of Liverpool. This saves 1300 t of CO2 by removing 1Mkm by road annually (Carr, 2011).

Water freight using barges and small vessels produces less emissions compared to heavy-duty trucks. It has the potential to stop GHGs emissions, reduce local pollutant emissions, mitigate highway congestion and improve road safety (Zou at el, 2008). A tugboat can typically move a ton of freight more than 51k miles before emitting 1t of GHG. At the same time a truck, releases nearly three times as much GHG over the same distance. Cancer-causing nitrous oxides are found in diesel exhaust, most of which comes from trucks. By converting diesel powered barges and coastal ships to natural gas, they could become even cleaner (Longman, 2010). According to Sea and Water (2008) assessments, emissions from short sea and coastal movements, 22 grams per tkm for water against 28 grams for rail and 59 grams for road. Water transport is greener, cleaner and more sustainable than road haulage, using less than a third of fuel and emitting less than a sixth of the pollution.

Yang et al (2013) found that water freight is a viable means of reducing CO2 emissions and lowering external costs and consequently is sustainable, economic and competitive. Water freight and ports take up less unspoiled land and require much less impervious surface. It is a way of mitigating highway congestion and reducing highway noise. It rescues the communities from being split by roads, orienting them towards their waterfronts (Luttenberger, et al, 2013).

The UK British Waterways found that one single 600t barge can move the equivalent of twenty-four 25t lorry loads. A proposed waste by water initiative could remove 0.33M dustcart miles from the streets of North London every year and the movement of aggregates in West London will save 43klorry journeys (British Waterways, 2002). Transporting the same tonnage of freight between two points by water instead of road has the potential to reduce by

three quarters the amount of carbon dioxide emitted (IWA, 2012). New waterborne freight services on the River Severn ensured that it saved 116 round trip lorry journeys and reduced road accidents, noise, congestion, vibration and the use of the aggregates in the road. The European Commission and USA have been supporting and promoting water freight as the only freight mode that can offer a realistic prospect of substantial modal shift from road as well as improve competitiveness and reduce environmental damage (Medda and Trujilo, 2010).

2.2.2 Low Cost

The congestion on road and rail networks is alleviated by water transportation and reduces the need for public sector infrastructure investments. Water freight helps to realize remarkable savings in fuel consumption (US Army Corps of Engineers, 2014). The importance of water freight increases in certain circumstances. When transportation fuel prices rise the cost of trucking will increase more quickly than the cost of either rail or sea on a tonne-km basis.Water freight becomes attractive when road tolls or delays attain, carbon taxes are levied on truck fuels, during the altered time competition, rail infrastructure capacity limits, poor commercialisation of rail services, regulation of driver hours; shortage of trained drivers, shortage of contractors, and concern over trunk road congestion (Baird, 2003; Bendall and Brooks, 2010).

Modal transfers to waterways may offer a cheaper route to reach final customers thus reducing total transport cost which increases the competitiveness of products and productivity of enterprises (European Communities, 2006). The cost and efficiency of water freight will also affect the profitability of export industries (Webb, 2004). The cost of logistics (inventory, transport cost) and external costs due to freight transport include costs of accidents, emissions and noise, costs related to climate change, nature and landscape damage and in addition to, operation, maintenance of public infrastructures, which are able to reduce these effects, by developing more sustainable solutions (Digiesi et al, 2012; Sambracos and Maniati, 2012).. Water freight often involves little infrastructure cost unlike navigable rivers, lakes and canals. However in particular locations substantial costs may be

incurred involving canal maintenance, wharf construction, channel dredgging to maintain conditions for water freight.

According to Platz (2008) water transport is the cheapest mode of transportation. The unit transportation costs of inland waterways are less than for road and rail due to high energy efficiency and reduced need for workers. Unlimited capacity of the sea is a key factor, because capacity can be increased without incurring the costs of building sealanes. Inland shipping is undertaken by vessels with an infinite variety of size, shape, capacity and propulsion. The capacity of water transport can be increased at negligible cost in comparison with other modes because much of the track is natural or semi natural (Hilling, 1999). By shifting more freight onto waterways governments can save money on road and rail related costs. Low costs allow water transport to offer competitive rates compared with heavy-duty vehicles (Zou et al, 2008). Transportation of low value or non-time critical bulk products and cargoes using waterways also saves the cost of storage facilities (Burn, 1984). Using barges as floating warehouses, business could save on transit costs and storage costs while the goods are in transit or awaiting discharge close to or at their destination (British waterways, 2002).

In the opinion of Coosa Aiabama River Improvement Association, cargo moved by the waterways earns an average transportation savings of $10.67/t over the cost of shipping by alternative means of transport (2013).

Water transport is important for European cohesion because it promotes European trade competitiveness; maintains vital transport links; decreases unit cost of transport; facilitates Eastern European integration; and relieves congestion from land based networks (ECMT, 2001). Barges move along isolated waterways generally following natural river channels. Thus, they require minimal modification to the land for support, unlike road or rail, so barges require few connections and waterside terminals (Coosa Alabama River Improvement Association, 2014).

The cost for the infrastructure construction and maintenance of water freight are lower than those for highway and rail (Zou at el, 2008). A study conducted by the German consultancy Planco in 2007 on the economic and ecological comparison of transport modes, inland water transport holds the most positive record: the overall costs of all external effects for bulk transport are 83% lower compared to road and some 70% lower compared to rail (Eede, 2010). An EU Green Paper Towards Fair and Efficient Pricing in Transport calculated the cost of road congestion at 2 per cent of GDP. IWT produces the lowest external costs of all transport modes (EU Roundtable 1997).

2.2.3 Energy efficiency

Waterway transportation of freight is inherently more than twice as energy efficient as rail transportation and eight times as efficient as truck transportation (HighBeam Business, 2014). Barges move one tonne of cargo an average of 245km per litre of fuel. Railroads can move the same amount of cargo an average of 176km per litre, and a truck only 66km per litre. Because of this efficiency, transporting freight by water generates fewer air emissions than rail or truck (Bonnerjee, et al, 2009). Comparing primary energy costs of water freight per tonne km 5 litres of fuel would achieve 500km by barge, 330 km by rail, 100 km by road and 6.6 km by air. Barges consume 50 times less fuel than the road fuel required by a single lorry (Glaves, et al, 2007). A barge can carry large loads of bulk materials up to five times its own weight. The cargo capacity of a barge is 15 times that of one rail car and 60 times greater than one semi-trailer truck (US Army Corps of Engineers, 2014). As a result water transportation is best suited to bulk commodities, agricultural products and construction materials (Comtois, et al, 1997).

Some typical examples of energy consumption by mode:

A truck consumes 4.06MJ/ton-km of energy to move a 7.3t cargo load

A train consumes 0.59MJ/ton-km of energy to move a 1kt cargo load

Inland navigation consumes 0.43MJ/ton-km of energy to move a 1.25kt cargo load (Dutch Inland Shipping Information Agency, 2004).

2.2.4 Economic advantages of water freight

The economic impacts of water freight are extensive. Economic impacts focus on the changes in travel times, and related consumers surplus, changes in employment and business activity and earnings (Fischer, 1999). The waterway network acts as an important catalyst to boost economic activity among the community. In rural areas, waterways transportation can ensure economic progress in outlying areas. In some areas, waterway services are necessary for the continued economic health of outlying areas. (Yassin et al, 2010). Waterways transfer a lot of intra-Europe freight. Water transport offers an important source of revenue and employment which leads to economic growth and prosperity (EC, 2013). SSS is important to promotes European trade competitiveness; maintains vital transport links and decreases unit cost of transport (EC, 2006).

The profitability of exporting companies is determined by the cost and efficiency of water freight. Waterborne transportation can compete in world markets making waterways a critical integral component of the manufacturing, distribution and industrial economy of the U.S.A, driving physical and economic development generating benefits worth billions of dollars annually to the U.S. economy (AASHTO, 2013). Sixteen percent of the nation's freight is moved by water for just 2% of the freight cost- a saving of over $7B annually for shippers and consumers (Toohey, 2002).

Due to traffic congestion, overland carriers have become undependable and water freight offers an alternative to alleviate congestion and reduce costs generating higher profit margins (Mulligan and Garry, 2006). In turn governments incur reduced traffic congestion and road damage and companies can enhance their green credentials and society gains from an ability to meet future freight capacity demands without incurring additional infrastructure construction and maintenance costs (SKEMA, 2009).

The benefits of waterways contribute to development. The National Confederation of Transport (CNT, 2002) concluded that 'the main advantage of water transportation according to the customers is the cost of freight (88.5% of respondents), followed by safety (64.6%) and finally the reliability of the deadlines and the level of damages, both with 37.7%' (Valois, et al, 2011). Transfers to safer water transport will bring huge direct and indirect economic benefits to society and enterprises. Water transport delivers positive impacts to the development of regions (EC, 206).

Examples of economic advantages of using water freight transportation in USA and Europe are detailed here. The contribution of the US port and inland waterways to the national economy in terms of value of cargo is described as 630Mt, with a value of $73B, (US Army Corps of Engineers, 2014). Every year the value of goods exchanged between states using ports and waterways exceeds $100B. Barges are used for the export of over 60% of the nation's grain and over 95% of soyabeans. For every $1 spent on improving the navigation infrastructure, the US Gross Domestic Product increases by more than $3. Freight moved by the inland waterways system yields an average transportation savings of $10.67/t over the cost of shipping by alternative means, and offers an annual saving of over $7B to the consumer. (Coosa-Alabama River Improvement Association, 2013).

In Europe 30% of container traffic to/from European ports at the northern coast is carried by inland waterways. At Rotterdam 39% of all containers are moved by inland fleets, an increase of 3% since 2001 at the expense of trucking. Eliminating port monopolies and giving shipping companies the option of handling their own freight generate significant savings of 10 to 25% of

transportation cost, and SSS can operate on many routes (Dupin, 2002). Water freight offers overall cost savings to the shippers for specific market segments.

2.2.5 Social benefits

Universally, social impacts emphasise changes in social patterns, social problems and lifestyles (Fischer, 1999). Social impacts of transport are defined as changes in transport sources (defined as a movement or presence of vehicle using infrastructure or only the presence of infrastructure itself) that positively or negatively influence the preference, well-being, behaviour or perception of individuals, groups, social categories and society in general (Geurs et al, 2009). Waterways can perform as an alternative transport mode in urban and rural areas and can connect both environments. In rural areas, the main social impacts of transport are social cohesion, use of space, accidents, public safety, noise levels, nuisance, soil, air and water quality and security (Geurs et al, 2009).

There are three main objectives to support water freight by the European Commission 1999.

(1) To promote the general sustainability of transport,

(2) to strengthen the cohesion of the EU and

(3) to increase the efficiency of transport in order to meet current and future demands arising from economic growth (Sauri and Turro, 2013).

SSS is considered important for European cohesion because it facilitates Eastern European integration; provides shorter transport routes to member states and improves the relationship between them (EMCT, 2001). The European Commission's thematic research summary on water transport (2013) identified that the inland waterway network has a huge spare capacity and is able to alleviate the busiest parts of the EU road and rail network. There is rarely congestion at sea. The transfer of freight from road to water would

reduce nuisance levels to those living nearby by 65% to 90%; (EU Roundtable 1997). Shallow draft barges operate primarily in areas away from the general population, thus are less exposed to urban areas than truck or rail. Water freight has fewer crossing junctures; as a result, the number and impact of waterway incidents are low when compared to truck or rail (BVB, 2009). Barges do not impose congestion upon the community. Freight can be shipped via coastal or inland ports to other ports where goods are transferred to truck or rail for movement to their final destination, thereby reducing traffic volumes on major corridors (Medda and Trujilo, 2010). It does not disturb the serenity of a community as tows are less frequent than rail or truck because of greater carrying capacities (Coosa Alabama River Improvement Association, 2014).

The efficiency of water freight increases with the reorientation of the activities of long-distance shipping companies and the modernization of processes, investments and expansion of general cargo handling facilities in ports (Valois, et al, 2011). The increasing efficiency of water transportation will assist it to meet current and future demands arising from economic growth. As a result water transportation will become an integral part of the logistics transport chain and also a door-to door service (Sambracos, 2007). Developments in water freight will automatically lead to invigoration and modernisation of harbours located in remote regions.

2.2.6 Safety

One of the important benefit of using water freight is its low accident rate. Compared to truck and rail, barge transportation has fewer accidents, fatalities, and injuries (NWF, 2008). Water freight also helps to improve road and railway safety by shifting cargoes from these modes onto water. Studies (Jacob, 2009; US Army Corps of Engineers, 2014; Valois et al, 2011; Yang et al, 2013) explained that safety of water transortation is an important reason to promote its wider use in the transport industry.

Using computer aided monitoring systems and advanced telecommunications equipments, waterways have been able to operate more efficiently and safely. The use of RIS provides waterways with a competitive edge over other modes

of transportation. RIS helps water transportation to connect with the modern developments in logistics and supply chain management, together with cost effective and environmental friendly logistics operations (Tournaye et al, 2010).

Other benefits of using water freight

Water transportation offers many other advantages. These include managing door-to-door cargo integrity, added security, agility in customer delivery, using containers, and frequent service based on a predictable transportation with weekly departures and arrivals (Valois et al, 2011). Water transportation is an alternative solution to the always increasing size of commodity flows. The just in time concept is suitable for properly managed waterways with reliable waterborne transport (IWA, 2012).

Other reasons to promote water freight include the expansion of transportation network capacities, port productivity improvement, revival of the maritime sector, intermodal integration, door-to-door delivery, just-in-time practices, modern logistics and low transport industry profitability (Baird, 2003; Sambracos, 2007). The EU promotes water freight to achieve the environmental goals stated in the Kyoto Protocol 1990. Waterways can accommodate vessels which carry containers competitively, including perishable goods requiring refrigeration. The just in time concept is suitable for properly managed waterways with reliable waterborne transport (IWA, 2012). Water freight can offer high on time performance in three major categories: container loads for connecting carriers, empty repositioning containers and domestic freight (Zou et al, 2008).

2.3 Water freight and logistics industry

Logistics is the management of transportation, warehousing and distribution of goods, service and related information from the point of origin to the point of consumption (Ballou, 2004). The Council of Logistics Management (CLM) defines logistics as “a part of supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services, and related information from the point of origin to the point of consumption in order to meet customer’s requirements” (Ballou, 2004, p. 4). Logistics plays a vital role in

many businesses because logistics cost is critical in achieving desired financial goals (Digiesi, et al, 2012). In making business strategies, logistics becomes an important driver of corporate-level profitability and growth (Abrahamsson, et al, 2003). Prudent management of logistics functions can achieve sustainable competitive advantage. Integration of water freight into intermodal transportation systems is vital and promoting and encouraging the use of non-road modes for freight transport will reduce the negative impacts of environmental and external cost and increases the sustainability of logistics strategies (Browne et al, 2007).

Intermodalism increases the efficiency and competitiveness of freight transport whilst retaining an environmental balance. The vision is to create a comprehensive door-to-door logistics chain that provides efficient, regular and frequent services that can compete with existing road modes and offers cost savings (Carr, 2011). Water transportation is a sustainable transport link in the door-to-door supply chain. SSS, coastal shipping and inland waterways offer waterborne transport of cargo and passengers by sea, rivers, canals and lakes as part of the logistics transport chain in many regions. Motorways of the sea supply more choices for the logistics chain originators by offering frequent, reliable, safe and secure means of transport (European Commission, 2006). Water freight is an integral component of comprehensive inter-modal approaches that attract higher cargo volumes, enhance networks and provide genuine door to door services (Loon, 2009).

The success of water freight depends on its full integration into the logistics chain and consequently, in providing door-to-door services to customers (Grosso et al, 2008).

Effective intermodalism requires the operators of different components of the supply chain to cooperate. Most water transport companies are too small to operate complete logistics services far away from the end ports (Seraphim, and Konstatinos, 2007) necessitating collaboration with other market players

to provide such services (Oestvik, and Vassalos, 1999). The benefits of SSS and onward use of IWT meet many logistics challenges (Carr, 2011). For example, if coastal vessels or SSS replace the long-haul leg of the freight transportation chain using trucks to pick up and deliver to final destinations, the trucking industry can be an ally or partner instead of a competitor for long-haul transportation.

After successful operations, Osprey Lines in the US and Samskip in Europe, noted that working with truckers and becoming intermodal providers were key elements in their success (Denisis, and Perakis, 2008).

Alliances between trucking companies and port authorities could promote integration. An intermodal provider offers reduced external costs per tonne-kilometre, reduced cargo handling time and costs, improved overall efficiency and reduced overall transportation costs. An intermodal transportation system benefits from the energy efficiency of rail and sea transportation for the long-haul leg and the flexibility of road for collection and distribution (Kreutzberger, 2001).

Many countries need an efficient logistics transport system which combines the benefits of all modes to maintain and increase competitiveness and prosperity. SSS should be developed as an integral part of the logistic transport chain and also a door to- door service (Sambracos, 2007). Many industrial centres are adjacent to waterways and water offers the fastest and most reliable service between destinations (Lee et al, 2010). An important objective in developing SSS is the integration of water transport efficiently into the door-to-door logistics transport chain. This requires new or specially adapted vessels and advanced and flexible ship designs and co-operation with other modes in the logistic chain and with shippers and forwarders to offer comprehensive networking and door-to-door services at competitive prices. The needs of SSS can be accommodated through dedicated terminals and services. Ports must consider how their efficiency could be enhanced to deal

with just-in-time logistics in SSS (Commission of European Community, 1999) which may be a continuation of deep-sea ocean transport and assist in the development of a hub-and-spoke maritime shipping system. The two factors determining the market success of SSS are the reliability in freight transportation and market segmentation. Low costs enable SSS to offer competitive rates compared with heavy-duty vehicles, which in turn help promote its market share (Zou et al, 2008).

According to British Waterways (2002) the potential and the probability of freight moving by canal depends on the supply chain characteristics of the commodity, the location and destination of commodity, barge technology, dwell times and availability and type of transfer equipment, infrastructure at transfer point, the technical ability of the canals to carry the commodity and the economic viability of moving by canal compared to other modes. For short distance flows, movement by barge can be cheaper than movement by road. The movement by barge can be the most cost effective solution for certain commodities over short distances where both ends of the journey are alongside the canal. Saldanha and Gray (2002) found that UK coastal ship owners felt that integration into intermodal transportation was important. If coastal shipping is an integral component of a multi-modal transportation network it can provide on-time reliable service and will meet modern door-to-door and just in time requirements (Perakis and Denisis, 2008). For coastal shipping to be viable in a multimodal transport chain the whole chain including land legs should be efficient and cost effective. To promote greater use of our coastal waterways, reliability and frequency of coastal sailings need to be improved, with door to door multimodal services and seamless integration of transport modes (CII, 2013). Coastal shipping can offer an effective and sustainable mode for long-haul freight transportation.

Barriers to integrating water freight into the logistics chain include additional cost incurred for transhipment in terminals, stowing of the ships, co-ordinating the links in the intermodal chain, quality control during the extra handling, waiting time and intermediate transhipment (European Commission, 2001). There is a need to raise awareness of the potential of waterborne transport in the supply chain. The value of water freight in the chain and the door-to-door

concept is unfamiliar to shippers and receivers. They need information about the importance of intermodalism due to the complexity of the transport chain (Defra and DFT, 2002). There are problems with exchanging loading units between the different transport modes and an additional risk of damage to goods. Intermodalism creates documentation problems for the whole chain and the responsibility for each component along the whole chain. Due to the complexity of the transport chain, tracking and tracing becomes more difficult. Road restrictions such as a Sunday ban on trucks servicing water freight decreases the effectiveness of the logistics chain. There are insufficient 'meeting points' between water transport and the market. More terminals are necessary to avoid delays (European Commission, 2001). The integration of water freight in the logistics chain could be achieved better, through better understanding and co-operation among logistics professionals and freight forwarders.

2.4 Water freight in Europe

The waterways network in the EU represents 5668 kilometres of canals, rivers and lakes. European waterborne transport benefits from favourable geography, limited land areas, and extensive coastlines and a traditional and successful operating culture among different nations. Twenty-seven out of 56 UNECE member states possess waterways for transportation. The largest navigable waterways in Europe are the Rhine and Danube (BVB, 2009). Waterborne transport is an integral part of the logistics chain in Europe's transport system. Rising concerns about the externalities generated by transport, transport liberalisation and the development of the trans-European networks concept promoted waterborne transportation in Europe (Sauri and Turro, 2013). Promotion of water freight, a part of the logistics transport chain in Europe and the regions connected to Europe aims to support a modal shift from the congested roads in Europe to sea (European Commission, 2006).

Intra-EU shipping is still considered as international trade by EU customs and other actors and the internal clearance of goods leads to unnecessary costs and delays that are not reflective of a truly single market (Aperte and Baired,

2013). Italy and the Netherlands use water freight extensively (Sauri and Turro, 2013), and using waterways in Belgium and France to deliver goods has helped to eliminate bottlenecks. France planned to expand the use of inland waterways to connect inland urban areas with the major deep-sea ports (Carr, 2011). Due to increases in traditional waterway traffic, notably raw materials for the construction industry, petrol products and cereals, commercial traffic on French waterways has increased and is still rising. The maximum speed allowed for boats in France is 12kmph and they are not noisy. These two qualities support the transportation of goods to and from the heart of cities without being a nuisance to people and a safer choice for transporting dangerous or toxic substances (Deborah, 2001).

Between 1995 and 2004, the tkm performance of SSS in the EU-25 grew by 32%, and SSS performs 39% of all tkm in the EU-25 (Commission of the European Communities, 2006). According to an estimated calculation, the share of logistics industry in Europe is close to 14% of GDP. European SSS moves 40-44% of the cargo tkm, second in mode share with a market share of 32% of intra-community trades (ECMT, 2001). SSS accounts for 38% of the business of European ports (Islam, et al, 2011). As a result, the intra and extra-EU trade has risen by 55% in value since 1999 (Commission of the European Communities, 2007).

The EU is spending money, time and effort on developing IWT and SSS to provide a good quality of life to the people, by adopting environmental friendly modes of transport. Compared to the UK the EU is far ahead regarding promotional activities for water freight. Many countries are looking towards the EU to learn different ideas, skills and techniques in the modern water transportation.

2.4.1 EU policies to promote water freight

EU policies on water freight development aim to dismantle market, legal and fiscal barriers through the liberalization of the cross-border distribution of trading services, increase in competition and cost reductions (Medda and Trujilo, 2010).To promote water freight, Individual Member States can work on

a voluntary basis on the diverse requirements and procedures to make it more uniform in the EU (Commission of the European Communities, 1999). The Union's environmental policies and CO2 targets encourage increased use of water freight (Commission of the European Community, 2006). The European Commission's decision to support water freight through funding effective R&D in new maritime transport technologies, aimed at enhancing the competitiveness of European shipping, the development of water transport in parallel with an increase of port efficiency and the improvements in reliability and safety are strategic advantages to the European water transport compared with other regions. To become a modern transport system, improving hinterland connections of sea ports is essential for European water freight (ECMT, 2001).

National, regional and industry level water freight enhancement is achieved through the legislative, technical and operational innovations and the establishment of a "European maritime transport space without barriers".

The European Commission document 'European Transport Policy for 2010: Time to Decide' found that SSS and inland waterways remain underutilized and provide a means of coping with the congestion of certain road infrastructure and the lack of railway infrastructure (Dupin, 2002). The formation of Short Seas Promotion centers (SPC) according to EU transport policy promotes SSS in the EU. They play a neutral and impartial role while giving advice on the use of SSS to meet the needs of transport users. The main activities of SPCs are information dissemination, information on transport solutions, a database on liner services, and identification and solution of bottlenecks (Commission of the European Community, 2006).

An important tool used for the promotion of SSS is Motorways of the Sea (Commission of the European Community, 2006). The "Motorways of the sea" are considered floating infrastructures that move goods by sea from one member state to another which aims to avoid congested land corridors, give access to countries separated from the EU mainland, and provide a better integration of waterborne transport with surface modes (Paixao and Marlow, 2007). The "Motorways of the Sea" concept aims to introduce new intermodal

maritime-based logistics chains in Europe, to improve access to markets throughout Europe, and bring relief to an over-stretched European road system. For this purpose, fuller use of integrated transport chain of maritime transport resources, potential in rail and inland waterways will have to be made. Four corridors were designated for the “Motorways of the Sea” are Motorway of the Baltic Sea, Motorway of the Sea of western Europe, Motorway of the Sea of south-east Europe and Motorway of the Sea of south-west Europe (EC, 2017).

The Trans-European Network (TEN-T) (Guitierrez and Urbano, 1996) is a programme focused towards the construction of missing links and terminals for inland transport and hinterland connections. The TEN-T comprises 89,511 km of roads (of which 30% more are planned), 93,741 km of railways, a significant fraction of high-speed lines (of which 30% more are planned), 330 airports, 270 international seaports, 210 inland ports, traffic management systems, navigation, and user information systems. The inclusion of ports in the TENs will provide a better link between the water and the land sides of the transport chain (Paixão Casaca and Marlow, 2007).The two projects related to inland waterways are the Seine North canal project and the Danube axis as part of the Trans-European Network (Tournaye, 2010).

The NAIADES programme (Navigation and Inland Waterway Action and Development in Europe) was adopted for the promotion of IWT in January 2006 by the European Commission (Kavamitsos, 2012). The main activities of NAIADES include the promotion of inland waterways by; coordinating the legal requirements at the European level, demanding constant modernisation of the fleet and navigational tools, maintaining and improving the image of IWT as an environmentally friendly mode of transport and modernising the infrastructure, with efficient links among the various basins and effective integration in the modal chain (Tournaye et, al, 2010). The NAIADES II package "Towards quality inland waterway transport" was started by the European Commission on 10 September 2013 as a continuation of the previous Naiades 2006-2013 programme. It aims to create the conditions for inland navigation transport to become a quality mode of transport, in order to shift freight to waterway

transport and reducing emissions. The period set out for the programme is 2014-2020 (EC, 2014).

PLATINA is a multidisciplinary and pan-European project to promote inland waterway transport. The primary activities of PLATINA include; to establish a knowledge network for bringing together all relevant participants, to assist in the implementation of NAIADES in Europe, provision of technical expertise and support, provision of organizational, infrastructural and financial support and platform deals with areas that require non legislative coordinative actions at the European level (Mihic, et al, 2011). PLATINA 2 is continuing the successful work of its predecessor PLATINA (2008-2012) and supports the European Commission, Member States, third countries, river commissions and the sector in the implementation of the European Action Programme for inland waterway transport (NAIADES II). Its important fields of action are “Markets & Awareness”, Innovation & Fleet”, “Jobs & Skills” and “Infrastructure” (European Commission, 2014).

2.4.2 Other maritime projects in Europe

Table 2.1: Some maritime projects in Europe

Project	Aims	Partners	Duration
West to East Freight Flows	Use new information and technologies to improve logistics chains in North-West Europe, Encourage modal shift from road-transportation towards rail, SSS and IWT	Germany, France, Ireland, Luxemburg, The Netherlands, UK	01.01.2010-30.06.2015
Promotion of SSS and Cooperation with SMEs	Promote SSS as a real alternative to road transport	England, Spain, Ireland, Portugal	01.01.2009-31.10.2010

Ports Adapting To Change	Promoting cross-border cooperation between small and medium ports of the Channel and the Southern North Sea, Improving their capacity to be more resilent to market changes and more responsive to innovation and entrepreneurship	England, Belgium, France, The Netherlands	01.01.2008-30.06.2012
Fostering Long Term Initiatives For Ports	Strengthen cooperation between ports and economic activities and ensure local governance optimising human, natural and energetic resources, develop cross-border cooperation between small and medium sized ports on common issues	France, England	01.01.2011-30.06.2015
Connect to Complete	Bolstering the competitiveness and accessibility of the Channel and North Sea ports through the development of a more efficient and sustainable transport network	England, Belgium, France	01.01.2007-31.12.2011

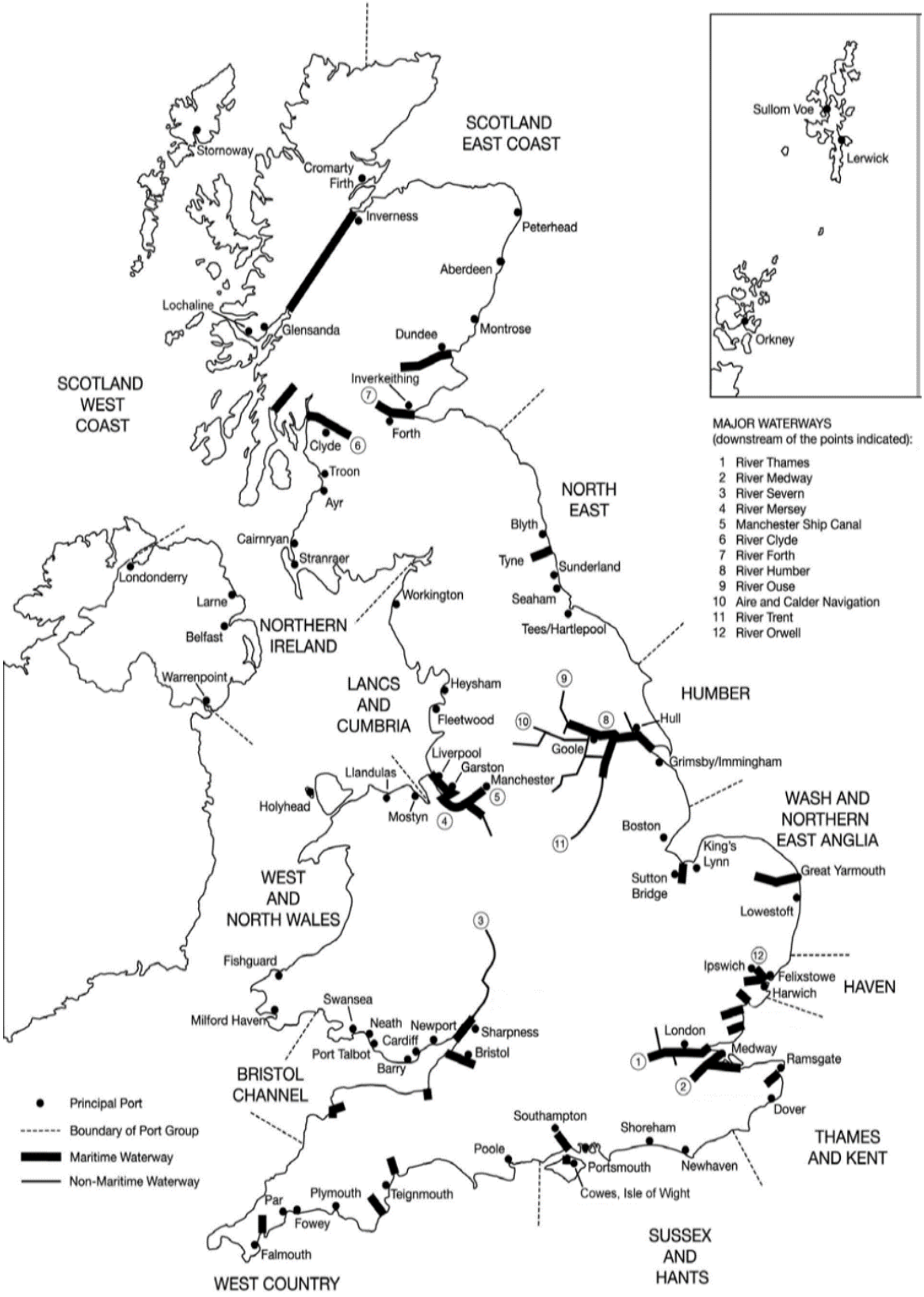
(Mayor, 2013)

2.5 Water freight in the UK

Water transport has played an important role in the development of the UK. The canal system built in the 18th century helped entrepreneurs to transport goods to larger markets and thus supported the UK industrial revolution and its growing trade, becoming the UK's main mode of transport for 18th and early 19th century haulage. An extensive coastline and many navigable rivers encouraged the movement of coal, grain, ore and a wide range of agricultural and extractive goods inexpensively. Between 1770 and 1830, the canal system rapidly expanded to over 6,400km in length (Sea and Water, 2008). During the 1950s and 1960s the emergence of road and rail transportation reduced the prominence of water transport. Today, rising environmental concerns and government grant system to encourage business to seek alternatives from road transport renewed the interest in waterborne transport. Now Britain has 11,072 miles of coastline and 300 ports. In the passable 3000 km of waterways, one-quarter can accommodate only a single narrow boat and elsewhere the maximum load is 700t (Geographical Magazine, 2001). At present over 1000km of waterways are in regular use for larger scale freight traffic. The UK waterways network has been owned by the Canal and River Trust since 2012 (Canal and River Trust, 2014).

The River Thames supports 2Mt of internal traffic.The River Severn carries coal, waste items, aggregates and building materials. The potential flows identified are waste paper and card on the Birmingham Canal, baled rags and bricks on Black Country canals, cereal pellets on the Trent and Mersey canal, recycled clothing on Stratford canal, household waste from North Worcestershire to Wolverhampton and canal side recycling plants in Birmingham and Wolverhampton (West Midlands Regional Assembly, 2007).

Figure 2.1: Principal ports, port groups and freight waterways in the UK (DFT, 2016)



In the UK, most liquid oil and petroleum products are transported through waterborne freight. Excluding North Sea oil and sea dredged aggregates, water transport is currently responsible for 9% of goods moved (Sea and Water, 2008). The UK leads SSS in the E.U. and the British fleet transported 347Mt in 2004, 16% of the total of SSS (Sambracos, 2007) rising to 313Mt in 2015 (Eurostat) 14% of EU tonnage. For liquid bulk, the UK transported 116Mt in 2015. The UK led the EU rankings for SSS of dry bulk goods (61Mt) and for goods on Ro-Ro units (92Mt) (Eurostat, 2017). There are mainly two factors attributable to the increase in the short-sea share. First the UK joining the EU and second is the development of the North Sea oilfields. UK exports by SSS are based on stable and continuous trade within EU (Bojkova et al, 2005). One of the major UK inland waterways carrying freight was formed by the integration of the Port of Liverpool and the Manchester Ship Canal. A green highway with a thrice weekly barge service connects the deep water Port of Liverpool with inland terminals along the Manchester Ship Canal. In 2008 October 1.2Mt of crude oil were imported in which 304kt were moved coastally around the UK (Freight by Water, 2009).

Table 2.2: UK major and minor port freight traffic, international and domestic by direction: 2005 to 2015 Mt

Direction	2005	2010	2015
(a) International			
Imports	262.3	244.0	254.1
Exports	163.7	146.9	134.7
All	426.0	391.0	388.8
(b) Domestic			
Coastwise			
Inwards	61.4	50.3	43.7
Outwards	64.9	50.2	45.6
All	126.2	100.5	89.3
One-port			
Inwards	30.4	18.3	16.4
Outwards	1.9	2.1	2.2
All	32.3	20.4	18.6
All domestic	158.5	120.9	107.9
Total			
Inwards	354.0	312.6	314.2
Outwards	230.5	199.2	182.5
All	584.5	511.9	496.7

(DFT, 2016)

As an indication of growing corporate interest in water transport in January 2007, UK supermarket Sainsbury's conducted a trial on the River Thames in London to test water as a modal option. The trial started from Sainsbury's distribution centre in South East London, moved food by barge to a west London store. In November 2007, Costal Bulk Shipping moved 1,300t of wheat 50 miles between Littlehampton and Southampton (Sea and Water, 2008).

According to DFT (2017) the total amount of goods moved for all domestic waterborne freight increased by 16% to 31.4Btkm in 2015. From 2014 to 2015, inland waters traffic has remained steady at 1.5Btkm, coastwise traffic increased by 26% to 24.5Btkm and one-port traffic fell by 9% to 5.8Btkm. In 2015, goods moved by domestic water transport accounted for 15% of total domestic freight transport in the UK. The decline of one-port traffics significantly affected the total volume of goods moved, which is approximately

half that recorded in 2015. Sixty per cent (31.4Btkm) of the total goods moved in 2015 were liquid bulk goods compared to 52% in 2014, when of liquid bulk was crude petroleum or petroleum products. Other traffic comprised dry bulk (23%), unitised traffic (11%) and general cargo (7%).

Table 2.3: Waterborne transport within the United Kingdom: 2005 to 2015

(a) Goods Lifted			Mt
	2005	2010	2015
UK inland waters traffic			
Non-seagoing traffic			
Internal	3.4	3.5	3.6
Seagoing traffic (by route)			
Coastwise	8.6	6.0	5.0
Foreign	32.0	31.3	33.3
One-port	4.8	3.0	5.2
Total	48.7	43.8	47.0
Coastwise traffic between UK ports	65.1	51.3	42.6
One-port traffic of UK ports	32.3	20.3	18.7
All traffic	132.8	106.3	98.1
b) Goods moved			Btkm
UK inland waters traffic			
Non-seagoing traffic			
Internal	0.2	0.1	0.1
Seagoing traffic (by route)			
Coastwise	0.2	0.2	0.1
Foreign	1.1	1.0	1.0
One-port	0.2	0.1	0.2
Total	1.6	1.4	1.5
Coastwise traffic between UK ports	39	30	24.5
One-port traffic of UK ports	20.3	10.8	5.8
All traffic	60.9	41.9	31.4

(DFT, 2016)

The above table reveals the current scenario of waterborne freight in the UK. It is a substantially underutilised mode and if used properly it could perform an important role in eliminating freight from the road and rail networks. (North West Freight Advisory Group, 2003). Issues to tackle in developing the waterways network include protection and enhancement of existing wharf locations, lack of suitable waterside freight handling facilities, strong reliance on road for domestic delivery, HGV access to wharf locations for transhipment, lock opening times, tidal rivers and tidal movements and pressure for development of other land uses. The annual budget for the Water Freight Grant is limited and inadequate to assist start-up costs of new waterborne freight services (West Midlands Regional Assembly, 2007). Indirect subsidies offered to rail freight and time taken to complete complex administrative processes and bureaucracy need to improve and until they do will limit the growth of waterborne freight (Transport Committee, 2013). Action plans such as to promote the use of water freight, improve canal work for more commercial transport, preserve and enhance existing wharf facilities and intermodal freight transfer point will help to improve the existing condition of waterways (West Midlands Regional Assembly, 2007). By developing a number of strategic inland ports to take feeder services closer to major ports, the parallel expansion of port capacity, the development of port-based distribution parks and waterway upgrades, could allow waterborne freight to expand its share from 24% to 32% so that road freight in the UK would be reduced to just a 50% share (Sea and Water, 2008).

An awareness creation about the potential of waterborne transport in the supply chain could be achieved through marketing and raising awareness with logistics professionals and freight forwarders. Co-operation between the DfT and DEFRA will promote waterborne freight. All water freight issues will be handled by the focal point Freight Logistics Division within the Department for Transport (Defra and DFT, 2002).

Britain possesses extensive coastlines, which serve key industrial and population areas, but still neglects shipping in the transport network (Rowlinson and Wixey, 2002). The UK government primarily encourages people to make use of the inland waterways for leisure and recreation, tourism

and sports rather than using the facility for goods transportation (IWAC, 2007). If the UK government wants to achieve its goal to transfer freight from roads to water-borne transport where this is practical, economic and environmentally desirable, government must offer more encouragement and investment for the development of water freight. At present, the only financing is available through the Freight Facilities Grants which is available towards the capital cost of rail and waterways freight equipment in cases where the traffic would be otherwise have gone by road (Parliament UK, 2013).

2.5.1 UK policies for water freight

The UK government has long advocated policy to promote alternative transportation to road to reduce congestion and environmental impact. The updated version of the UK government's sustainable logistics strategy, aiming to reconcile climate change, competitiveness/productivity, equal opportunities, quality of life, safety, security and health objectives (DFT, 2008). National policy supports an increase in the amount of freight movement on the UK commercial waterways. The government commitments to develop modal interchange between SSS, road, rail and inland waterways, is aiming for sustainable distribution, so as to encourage greater use of rail and waterborne transport for freight. Thus "the Government wishes to promote the transfer of freight from roads to water-borne transport where this is practical, economical and environmentally beneficial"(Defra,2000:16). The transfer of HGV's from local roads to inland waterways reduces the environmental impact of freight distribution in terms of energy and pollution (West Midlands Regional Assembly, 2007). The UK government is aiming to transfer 3.5% of road freight movements to water. It could be done by ships re-routing to ports nearer to origin and destination, bulk and unit loads shifting to coastal traffic and making use of the UK's estuaries and by developing the inland waterway network (Association of Inland Navigation Authorities, 2001).

Waterways are the perfect alternative to road transport in meeting these objectives. According to the Inland Waterways Advisory Council (IWAC) if properly developed waterborne freight transport can play a significant role in helping the UK to meet the Government commitments of reducing carbon

emissions by 60% by 2050 (IWAC, 2007). The British Marine Federation, argues that moving freight into waterways would help to relieve congestion on motorways (2010). Thus the government introduced the Waterborne Freight Grant, which was intended to assist start-up costs associated with new coastal shipping services which divert goods traffic from road to sea within the UK (Aperte and Baired, 2013). The grants have stimulated new initiatives. A partnership between southern local authorities, private waste management companies and the British Waterways authority have introduced Waste by Water, a pilot project to transport waste out of London(Geographical Magazine, 2001). The introduction of Freight Facilities Grants (FFGs) helped to stimulate growth in waterborne freight by assisting with added capital costs faced by companies proposing to transport goods by water rather than by road. Successive governments have been committed to develop a greater take-up of FFGs and grants can be paid where transfer of freight from road to water will include environmental benefits and the traffic would not be feasible without grant (Defra, 2000; IWAC, 2007).

A study conducted by Peel Ports suggested that Government should take steps to encourage water freight (Paliament UK, 2013). Based on many studies conducted by the government departments on water freight the UK government is ready to follow many initiatives to encourage an increase in freight carried on the waterways. They are extension of water freight facilities grant, aggregate levy sustainability fund for waterborne aggregate transportation, encourage good planning by preparing a good practice guide, a single window operation at DfT for waterway freight issues, prioritise water freight by navigation authorities, provide secretarial support for a reconstituted freight study group and further assistance for specific projects which contribute to national policy.

The Government also produced many proposals for a smooth running water transport. In 1996 the British Government introduced a Directive which safeguarded 32 wharves along the River Thames for cargo handling use (Hilling, 1999). By working together, the navigation authorities and local planning authorities could easily identify and seek to retain wharves with good freight potential. Navigation authorities can reduce the charges of freight

vessels in the interests of encouraging more freight traffic on the waterways. Assessing the need for dredging and improvements of the infrastructure of waterways are the responsibilities of individual navigation authorities (Defra and DFT, 2002).

2.6 Water freight in the South West UK

The SW UK is the largest of the English regions in terms of area, and home to 5M people. It includes the counties of Cornwall & the Isles of Scilly, Devon, Dorset, Somerset, Wiltshire and Gloucestershire plus the unitary authorities of Plymouth, Torbay, Bournemouth, Poole, North Somerset, Bath & North East Somerset, Bristol, South Gloucestershire and Swindon. According to the South West Regional Ports Association the SW region extends from the SW peninsula to the Severn Estuary and Poole harbour (SWRPA, 2009). Ports in these counties act as regional gateways and important drivers of economic growth. The network of ports along the south coast of SW UK brings excellent opportunity for coastal shipping and SSS for distribution of intraregional cargoes and for wider trade with the rest of the United Kingdom. The ports in the SW handle cargoes such as coal, metals, timber, aggregates, paper, pulp, agricultural products, petroleum based materials, fertilizers, peat, salt and scrap materials. China clay is a mineral which has traditionally exported out of the south west (SWRPA, 2009). A number of EU countries such as France, Ireland, Portugal and Spain are geographically well placed in relation to this region. By the development of coastal shipping links between regional ports, seaborne trade links can be developed with these European countries, which will in turn, result in substantial economic activity for the region and maximise local and regional economic development (Chang, 2011).

2.6.1 CAD

2.6.1.1 Devon

Devon is the third largest county in England and home to 1,135,500 residents (Devon County Council, 2011). It forms part of the SW Peninsula of Great Britain bounded to the west by Cornwall and to the east by Dorset and Somerset. In the north lies the Bristol Channel and the English Channel borders it to the south. The geographic county of Devon comprises the administrative county and the unitary authorities of Plymouth and Torbay (Devon County Council, 2014). It has a coastline of 422km at Mean Low Water and it becomes 695km at Mean High Water. Being a maritime county Devon develops many benefits from its proximity to the sea including economic, social and environmental gains. It has 14 small and large ports. Main commercial activities on these ports are the Ball Clay industry at Teignmouth and Bideford, ship building, boat building and repair at the Exe and the Axe, and fishing at Dartmouth, Salcombe and Kingswear (Devon County Council, 2008). Plymouth is Devon's major bulk port and second biggest port in the South West region after Bristol. Ports in Plymouth (Cattewater, Sutton Harbor, Millbay and Devonport) focus on bulk and breakbulk cargo handling, marinas, ferries and support to the Royal Navy respectively (Plymouth City Council, 2010). Devon County Council has taken a policy to protect and improve existing ports for better functioning and to develop a sustainable environment. Thus Devon Structure Plan 2001 to 2016 transport policy TR1 says, Devon travel strategy promotes the development of more effective and integrated transport and freight networks, port facilities and their associated infrastructure should be maintained and developed in order to ensure the ports fulfil their strategic function: Plymouth should be supported as a commercial and fishing port linked to the European transport network, Teignmouth as a commercial port, Bideford as a commercial port and Brixham as a fishing port (Devon County Council, 2004).

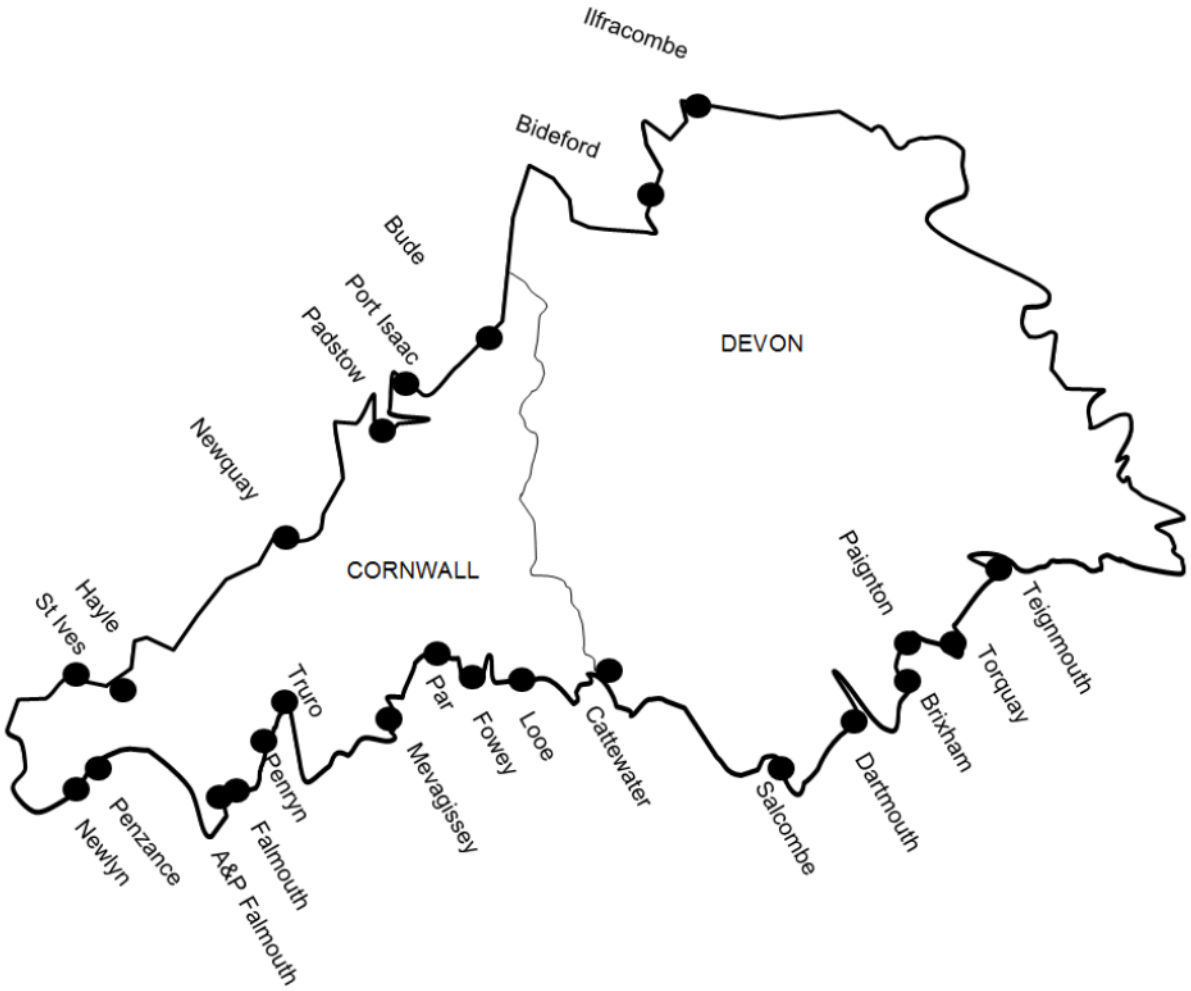
A brief description of ports in Devon is displayed in Appendix A.

2.6.1.2 Cornwall

Cornwall is a peninsula, the north and west bordered by the Celtic Sea, to the south by the English Channel, and to the east by the county of Devon, over the River Tamar. It is located in the far west of Great Britain falling into the Atlantic Ocean, almost completely surrounded by the sea (Cornwall County Council, 2014). Cornwall's coastline stretches for over 400 miles and all towns and villages are within 20 miles from the coast. This diverse and extensive coastline is important for Cornwall's economy. Ports and harbours are vital to the economy because they are serving as gateways into and out of the region and provide a base for trade and employment by serving local, national and international markets. Fishing, mining and mineral extraction, boat building and repair are the important activities in relation to harbours and ports. Cornwall's marine sector has great influence in the UK marine industry. Almost one in seven marine jobs and 8% of the marine industry turnover in the UK accounts for Cornwall's marine sector. According to Cornwall's maritime strategy the marine industry sector produces around £500M of the Gross Domestic Product of Cornwall and generates more than 14000 jobs (Cornwall Council, 2012). By recognising the significance of the maritime sector, Cornwall County supports improvements at key ports to improve links beyond the County thus makes the region's future prosper in the long term (Cornwall County Council, 2004). The Cornwall maritime strategy has taken different policies for the well-functioning of its ports and harbours. Major policies understand the strengths, issues and opportunities in relation to harbours and ports, ensuring port infrastructure and waterfront locations are within the regeneration scheme, protect and develop port infrastructure, promote port development for the expansion of other economic activities such as fishing, freight handling, ship repair, yacht and boat construction, and promote the role of Cornwall's large and small ports and harbours in creating job and business opportunities (Cornwall Council, 2012). A map of the main ports in Cornwall is given below.

A brief description of ports in Cornwall is presented in Appendix A.

Figure 2.2 Main ports in CAD



Source: (KUZNETSOV, 2014)

Table 2.4: West Country major and minor ports, all freight traffic, by port and direction, annually: 2005 to 2015 kt

Ports	2005	2010	2015
Major			
Fowey	1270	773	513
Plymouth	2308	2208	2217
Poole	1712	982	582
Minor			
Dartmouth	40	z	z
Exmouth	0	0	0
Falmouth	570	540	254
Padstow	78	126	191
Par	315	z	z
Porthoustock	70	250	82
Teignmouth	595	406	359
Truro	23	22	5
Weymouth and Portland	190	152	170

(DFT, 2016)

2.7 Water freight in CAD in detail

The movement of goods in and out of SW UK depends upon ports and waterborne transport (Cornwall City Council, 2012). CAD has widespread coastlines and many ports perform functions such as commercial, ferry, recreation and leisure activities. Main destinations of SSS from CAD ports include Spain, Finland, Holland, and Germany (DFT, 2010). There are six senior commercial ports in CAD. Bideford, Plymouth, Teignmouth are in Devon and, Falmouth, Fowey and Truro are in Cornwall. The ports of Plymouth and Fowey are recognised as national major ports. Among these ports Plymouth is the largest port based on port activities. Since this study emphasises different port activities and the best suited water transportation for goods

movement such as inland shipping, coastal shipping and SSS, this section explains the nature and potential for water freight in these six ports in detail.

2.7.1 Waterborne transportation in Devon

Plymouth, also known as Britain's Ocean City is blessed with four natural ports. They are Cattewater, Sutton Harbour, Millbay and Devon-port. The presence of these four ports in Plymouth has made it as, one of the South West and UK's largest and most diverse ports. Devonport is working as a centre of the Royal Navy and Ministry of Defence (MoD) Facilities. Commercial port activities are mainly conducted through the ports of Millbay, Sutton Harbour and Cattewater (Plymouth City Council, 2010). The Cattewater Harbour comprises Cattedown Wharfs, Victoria Wharf and Pomphlett Wharf, which provide the primary commercial port facilities in the Harbour. Together, these three operators are handling approximately 1.8Mt of mixed bulk cargoes per annum, of which a major part is represented by imports of petroleum products (1.2Mt) (Plymouth City Council, 2010). The Cattedown Wharves moves 35% of the total dry cargo throughput at the port and is the only facility offering liquid bulk facilities. The major activity of the wharves is the import of petroleum, diesel, heating and marine gas oil. Using small coastal tankers of 5-6,000 dwt petroleum products are delivered from refineries in the North East and Swansea. The berth can handle a volume of 1.2Mt of liquid cargo each year. Other imported goods are animal feeds which represents 45-50% of the all dry bulk moved by the port, fertilisers, timber, cement, coal, and small quantities of salt, clay, grit and a large quantity of fish to deliver to a nearby fish processing company. The management has made two purpose-built warehouses recently with 2,500-3,000t capacity and each of them can handle a throughput of 25kt per annum (Plymouth City Council, 2010).

Pomphlett aggregate export terminal is on the south bank of the Cattewater Harbour, operated by Bardon Aggregates Plc. The jetty is used for the export of limestone from nearby Moorcroft Quarry and to import cement from Germany. It has three 1500 cement silos and sixteen 220 aggregates bins. The jetty is able to accommodate ships up to 4000dwt and normally shipments are intended for the Channel Islands, Isle of Wight, Sheerness in Kent for the

South-East's production firms of construction materials and occasional shipments to other destinations of the UK and Europe. Agricultural lime is shipped to Holland. There are plans for the repossession of land for development to handle cement (Plymouth City Council, 2010).

Victoria Wharf acts as the primary facility in the port for handling exports of china clay. It moves nearly half of the port's total dry bulk cargo throughput. Other exporting cargoes include grain and scrap, and imports are small parcels of feedstuffs, timber and general cargo. The wharf is owned by the Victoria Group, and following a major upgrade and improvements the facility is well equipped and offers three berths over a total quay length of 250m. It handles vessels of up to 8,000dwt with a maximum beam of 18m and length of up to 140m. The facilities include extensive open and covered storage and modern cargo handling equipment enables it to move wide variety of bulk and packaged commodities. It also has a large warehousing area and two grain silos. (Plymouth City Council, 2010).

The main activity of ABP at Millbay Docks is the Continental Ferry port. The maritime traffic is mixed passenger car/HGV roll-on/roll-off (ro-ro) ferries to Roscoff, Brittany and Santander, Spain operated by Brittany Ferries. The port also handles bulk and general cargo. It offers up to 5,420sq m of covered storage and around 34,000sq m of additional open storage for goods and vehicles (Plymouth City Council, 2010).

Table 2.5: Summary of Port of Plymouth main Trades and Markets

	Direction	**Market**	**Outlook**
Liquid Bulk			
Oil Products	Inward (coastal UK and near-Continent)	Far South West	Stable
Dry Bulk			
Clay	Outward	Europe (Spain)	Declining
Animal Feed	Inward (from Rotterdam)	Local/Regional	Stable; seasonal
Stone	Outward	Channel Islands, SE England	Stable
Stone	Inward (from Ireland)	Local/Regional	Stable
Fertiliser	Inward (from Rotterdam)	Local/Regional	Declining; seasonal
Cement	Inward (from Germany)	Local/Regional	Growing
Salt (for road treatment)	Inward	Local /Regional	Growing depending upon weather
Fish	Inward	National	Declining
Ro-Ro HGV	Inward (mainly)	Regional/National	Stable

Source: Plymouth City Council, 2010

Table 2.6: Plymouth port traffic 2016

Plymouth port traffic: 2016							
	Tonnage: kt						
	Foreign traffic			**Domestic traffic**			
	Imports	**Exports**	**All**	**Inwards**	**Outwards**	**All**	**All traffic**
Liquid Bulk							
Oil products	649	-	649	770	-	770	1,419
All liquid bulk traffic	649	-	649	770	-	770	1,419
Dry bulk							
Agricultural products	69		69	11	-	11	80
Other dry bulk	39	436	475	191	93	284	759
All dry bulk traffic	108	436	544	202	93	296	839
All bulks							
Bulk fuels	649	-	649	770	-	770	1419
Other bulks	108	436	544	202	93	296	839
All bulk traffic	756	436	1192	972	93	1066	2,258
Other general cargo							
General cargo & containers <20'	2	6	8	2	0	2	10
All other general cargo traffic	2	6	8	2	-	2	10

Source: DFT, 2017

Teignmouth is an historic port on the mouth of the Teign estuary. It has been a trading port for 300 years. Associated British Ports (ABP) is running the commercial activities at the port. The port is equipped to handle most of the cargoes types ranging from bulks, mini bulks to palletised, unitised and general cargo. The main cargo exporting from the port is ball clay which is mined locally at Kingsteignton and exported by WBB and Imerys to destinations throughout Europe and imports are animal feed, fertilizer, timber, building materials, stone and coal. Every year there are over 800 shipping movements handling more than 600kt of cargo. It includes exports of 380kt and imports 270kt all transhipped from continental Europe. (Teignmouth Harbour Commission, 2014).

The Teignmouth port has five working berths, fully equipped to handle a wide range of cargoes for both import and export. There are 9,300 square metres of warehousing and a large area of quayside storage. The port has its own fully computerised warehouse stock control system. Its total on-site storage capacity has increased to 150,000sqft. The port can accommodate vessels more than 100 metres in length and up to 5metres draft on the highest spring tides. Investments made by ABP for the development of a new western quay have created room for more frequent arrivals of larger ships. ABP also has plans for another £4m investment to build a replacement quay line 3m long and to provide more additional storage as practicable on site (Plymouth City Council, 2010).

The main activity of the port in Bideford is the import and export of general cargoes. It exports ball clay to Spain and Finland, imports road salt and sand. The port has 300m of modern quay available every day on the tide for vessels. Ships of 90+m with draft of 4.5m regularly export clay from Bideford port. The port owns a Priestman crawler crane and a new state-of-the-art Fuchs grab rehandler (Plymouth City Council, 2010).

2.7.2 Water freight movements in Cornwall

The port of Falmouth is situated within the Fal Estuary in SW UK. Falmouth Bay is the third largest natural harbour in the world. It is a deep-water harbour and offers all the services and facilities required by modern commercial

activities. The docks are equipped with commercial cargo handling facilities. A&P Falmouth handles a wide variety of cargoes from bulks to break-bulk and containers. The main cargoes are fertilisers, coal and stone products, all kinds of general cargoes and bulk, bagged, packaged and palletised goods. The port has the UK's largest offshore bunkering facility and provides all grades of marine fuels. It is the largest ship-repair complex in the UK with three large graving docks and provides deep water berthing for vessels up to 100kdwt (Falmouth Harbour Commission, 2003). They are privately controlled by A&P Falmouth part of A&P Group. In Cornwall, Falmouth is the largest and busiest sea port and an important maritime service base for the entire SW UK. It offers a wide variety of services to commercial shipping including dry docks, bunker barges, cargo handling, lay-up berths, casualty moorings and underwater services. The fishing industry in Falmouth has significant economic importance to the region. The location and deep-water facilities of Falmouth are the major advantages over other harbours in Cornwall. Falmouth remains a busy and vibrant fishing port with an importance on high value sea food (Plymouth City Council, 2010).

There are many businesses running at the port of Falmouth. Falmouth Oil Services, Pendennis Shipyard, Falmouth Fish selling, and a range of smaller firms are supporting local marine business activities. Many development plans and waterfront projects are planned for the port. The major one is an £85 m scheme to refurbish and enlarge Falmouth Docks. Plans for a new wharf, a cruise terminal and dredging of the channel to enable larger cruise ships will provide increased cargo operations in the future (A&P Group Limited, 2014).

Table 2.7: Falmouth Berths & Docks

Berth	Length (m)	Depth alongside (m)
Country Wharf	204	8
Duchy Wharf	240	8
Queen's Wharf	198	6.5
King's Wharf	190	6.5
Empire Wharf	150	6.5

Source: Falmouth Harbour Commissioners, 2003

Fowey Harbour is situated on the south coast of Cornwall, on the western side of the mouth of the River Fowey. It is a natural deep-water harbour, and is the largest exporting port on the SW peninsula, over 40% of all cargoes handled in the SW passed through Fowey. It is a busy commercial port where export of china clay is the only major activity which shipped to destinations all over the world (Fowey Harbour Commissioners, 2012). In 2011 out of the 230 vessels which visited the port, 200 were for the china clay trade. Some clay is also imported along with other cargoes.

Imerys Minerals Ltd operates the commercial docks, and they have made investments and positive initiatives in the port infrastructure and the region. The store for collecting china clay can hold up to 22,000 tonnes in 14 separate bays. In 2010 the port handled nearly 750,000 tonnes of clay. Exports of aggregates are gradually growing, and Cornwall Council depends on Fowey for importing salt for road gritting. The port is accessible in all weather and all states of the tides. Other than commercial activities Fowey attracts cruise liners. There are two landing places designated for this business. Export of aggregates and imports of specialised clay, links Fowey to ports and harbours on the south coast and Europe through SSS (Plymouth City Council. 2010).

Table 2.8: Fowey port traffic 2016 (Source: DFT, 2017)

Fowey port traffic: 2016							
	Tonnage: kt						
	Foreign traffic			**Domestic traffic**			
	Imports	**Exports**	**All**	**Inwards**	**Outwards**	**All**	**All traffic**
Other dry bulk	2	481	483	10	0	10	493
All dry bulk traffic	2	481	483	10	0	10	493
All bulks							
Other bulks	2	481	483	10	0	10	493
All bulk traffic	2	481	483	10	0	10	493

Truro is an inland port that lies at the head of the Fal Estuary in Cornwall. The port of Truro is 2,500 acres in size. As a multifunctional port it encompasses laid-up shipping berths for vessels up to 190m in length, commercial cargo facilities for coasters up to 85m, fishing and aquaculture, rental of foreshore, leisure craft moorings for local and visiting boat owners and covered and open storage areas. Advantages of using the port are its location in the centre of the SW UK with a hinterland extending throughout Cornwall, Devon and the South peninsula, low port charges, low berth utilization and inland location offering low cost road haulage (Carrick District Council, 2007). Cargoes handled at the quay includes bulk such as cement, sand, aggregates, china clay, scrap metal and recycled glass, and break-bulk cargoes include timber, blocks, building products and one-off cargoes i.e boat hulls, steel coils etc. Truro port services operates two cranes of 35t and 30t and front and side loading fork-lift trucks of up to four tonne capacity and various specialist equipment.

The main commercial dock is Lighterage Quay which is 350m in length and can service commercial vessels up to 2,000dwt. Covered and open storage facilities (6,000 covered, 7,000 open), stevedoring, fresh water and weighbridge are available at the Lighterage Quay. The port offers deep water sheltered lay-up berthing for up to nine vessels up to 219m in length. The Harbour Authority has planned to upgrade facilities includes maintaining a dredging commitment, improved navigational lighting, upgrading quay surfaces and providing security for goods on the quay which will enable the efficient, safe and quick handling of goods (Plymouth City Council, 2010).

Among these six ports, lime stone, china clay and ball clay are the main products exporting from Plymouth, Fowey, Teignmouth and Bideford ports. Of this, the export of china clay from Plymouth port is declining. The port of Fowey plays an important role in the south west freight traffic as most of the cargoes are passing through it. The port of Falmouth as the UK’s biggest ship repairing facility makes the entire region self-sufficient in ship maintenance activities. The management of each port has a plan to develop the port’s facilities or some of the ports infrastructure already developed to receive more shipment. Coastwise and SSS from Fowey and Plymouth shows a slight difference in their yearly freight traffic

In 2013 Fowey's total freight traffic was 656 and in 2012 641; Plymouth's total freight traffic in 2013 was 2,162 and 2,374 vessels in 2012 (DFT, 2014).

Table 2.9: UK major ports freight traffic, international and domestic by direction: 2016 kt

	Domestic		**International**			**Total**
Port	**One Port**	**Coastwise**	**EU**	**All other short sea countries**	**All deep sea countries**	**All routes**
Fowey	0	10	316	167	0	493
Plymouth	0	1068	1048	227	0	2343

Source: DFT, 2017

2.8 Challenges faced by water freight

Although, water freight has many advantages as a mode of transportation the development of water freight movement in many parts of the world has been slow (Sidaway et al, 1995). Barriers to the development of waterborne transportation are mainly classified into: lack of sufficient port infrastructure and hinterland connectivity; lack of support and promotion from the government; DFT and EU; insufficient tax incentives and subsidies; regulations on marine traffic; attitudes towards water freight; weather and tidal constraints; inadequate public investment; market demand and the speed, frequency and reliability of water freight services (IWAC, 2007 ; Li and Notteboom, 2011; CII, 2013; Valois et al, 2011; Sea and water, 2007).

In the case of inland water transportation, infrastructure plays a prominent role. Inland navigation can utilize its full potential only when sufficient investments are made to resolve limited dimensions of certain rivers/canals, poor air drafts,

limited opening hours of locks/ bridges and missing links in the network. Unless these investments occur, the position of vessels cannot be used optimally, and this will result in increased costs throughout the supply chain and a distortion of the competitive position with other transport modes (Li and Notteboom, 2012). Issues in developing inland waterways include the protection and enhancement of existing wharf locations, lack of suitable waterside freight handling facilities, HGV access to wharf locations for transhipment and pressure for development of other land uses (WMRA, 2007). Some other factors inhibiting the use of inland waterways include the condition of the infrastructure and vessels, the shortage of skippers and crew, and the approach adopted to freight by some navigation authorities and increasing competition from rail in some market segments (Webb, 2004; Defra, 2002). The inability to deliver a competitive transport service and lack of commercial interest in water freight are the main two barriers to future use (Sea and water, 2007).

The reasons for poor utilization of coastal waterways are many. They include high costs at major ports, shallow draft at non-major ports, a multiplicity of non-tariff barriers, inadequate road and rail connectivity to ports, impediments to import and operation of coastal vessels and lack of awareness of coastal shipping amongst cargo interests (CII, 2013). Factors delaying growth of coastal shipping are legislation/regulation, inadequate infrastructure at ports, awareness and consistency of service, cost and availability (TATA, 2013). The cost of waiting time for berthing of ships and port expenses for loading and unloading of containers also create challenges in using coastal shipping for freight movements (Valois et al, 2011). The main weakness of coastal shipping is that it cannot perform a complete door-to-door transportation service, because it creates breaks in the transport chain system. To complete a door-to door service, coastal shipping should be a part of multimodal or intermodal transport systems (Paixao, and Marlow, 2002). Due to the pronounced imbalance between incoming and outgoing trade volumes in ports regarding intra- community transport, vessels cannot operate at full capacity, which makes it difficult to keep transportation cost low. Restrictive labour hours and

labour conflicts, which affect terminal working hours, and impacts on a vessel's stay in port are enormous in terms of time and costs (Blonk, 1994).

According to Packer (1995) most freight movements in coastal shipping in the UK are too short-distance to serve the geographic concentration of economic activities in the UK. Other disadvantages of coastal shipping relate to the port of operations, corporate culture and structure, innovation, information technology/information systems, marketing and customer service approaches (Paixao, and Marlow, 2002). The lack of reliable statistics creates problems when governments are interested in making an accurate analysis of a trade and makes it difficult for ship owners to identify potential markets where they could offer coastal shipping services. The lack of infrastructure facilities in ports creates long turnaround delays. Many inland waterways ports are not sufficiently developed. These ports do not have handling facilities adapted to sea-river vessels (Blonk, 1994).

The concept of just in time denotes less and smaller stocks, more frequent and smaller consignments, need for speedier, more reliable and safer transportation. Coastal shipping has difficulties in responding to the just in time concept (Paixao, and Marlow, 2002). Coastal shipping is not as flexible as road transport. The liability of the ship operator in the case of accidents varies significantly. This complexity in the compensation system influences the choice of the shippers to the disadvantage of coastal shipping. Complex documentation and administrative procedures in the ports are not shipping owner or shipper friendly. Ship owners in coastal shipping are not using existing electronic data interchange systems. The services offered by coastal shipping have not been marketed efficiently; therefore, the industry has tended to become fragmented and to some extent isolated from shippers (Blonk, 1994).

Various obstacles hinder SSS from developing faster: it has not yet reached full integration in the multimodal door-to-door supply chain, it involves complex administrative procedures and it requires higher port efficiency and good hinterland accessibility (Commission of the European Community, 2006). Competition between different national rail firms, poor regulation and

management, limitations in technical training and skills development and the shippers' unwillingness to support short sea service are hurdles in the growth of SSS (Wood, 2004). The lack of government policy to develop waterway systems, observed gaps in regulatory issues, shortage of government incentives, increased rates in ports, fleets with aged vessels, the need for more modern equipment in ports, new investments for the integration of the transport logistics chain, the long distances from ports connecting to production centres, slower transport, port infrastructure close to saturation and access restrictions from the sea (depth) and land (road and rail) all present obstacles against the use of SSS (Valois et al, 2011).

Customs clearance rules, limited understanding of the costs and benefits associated with SSS, lack of port partnering, existing infrastructure may not be capable of handling large volumes of short-sea traffic, frequency and flexibility of service does not meet shipper requirements, high operational costs, shortage of vessels suitable for use in high labour costs, delays and fees, reasons for shippers to switch modes/operations have not been effectively demonstrated or communicated, and high labour costs are significant impediments to the development of commercially viable short sea operations (1-95 Corridor Coalition, 2005). SSS must aim for full integration of the logistical chain, improvement of the image of maritime transportation, simplification of the currently complex administrative processes and enhancement of port efficiency so as to compete effectively with unimodal road vehicles (Sauri and Turro, 2013).

2.9 The potential for water freight in the South West UK; an evaluation

A detailed analysis of available literature on the research topic was conducted. The literature review explained the benefits of water freight, the importance of water freight as a sustainable mode of transportation and how it can make a difference in the socio-economic status of a society. The review also considered the relation of water transportation with the logistics industry, water freight in Europe and the UK, policies formed for the promotion of water transportation and challenges that water freight faces.

Water freight has a special place in the logistics industry because of the potential benefits it offers (Medda and Trujilo, 2010; Carr, 2011; EC, 2013; BVB, 2009; Hilling, 1999; Sambracos, 2007; Platz 2008; British waterways, 2002; Valois, et al, 2011). Also, as a sustainable mode of transportation, water freight has an important role in the transportation industry to keep the industry green. Extensive research (Sauri and Turro, 2013; Sambracos and Maniati, 2012; Planco, 2007; Eede, 2010; Sea and Water, 2008; Glaves, et al,2007; IWA, 2012) clearly stated that the benefits of water freight as a sustainable transport mode can improve competitiveness and welfare of the industry and society. According to the EC (2013) waterborne transportation is an important source of revenue and employment which leads to the economic growth and prosperity of the EU. Studies based on the socio-economic impact of water freight (Yassin et al, 2010; AASHTO, 2013; Toohey, 2002; SKEMA, 2009; Valois et al, 2011; EC, 2006; Sauri and Turro, 2013) identified that the waterway network acts as an important catalyst to boost economic and social impacts in the Community.

By realizing the importance of water freight within the EU, waterborne transport became an integral part of the logistics chain in European transport systems which aim to support a modal shift from the congested roads to the sea (EC, 2006). The formation of policies and funding effective R&D in new maritime transport technologies, support the sustainable development of European transport, help to increase interregional trade by means of efficient and low-cost transport services and contribute to regional development and prosperity in Europe through the facilitation of intra-European trade (SKEMA, 2009). Programmes such as Motorways of the Sea, TEN-T, The NAIADES I and II, PLATINA1 and 2 support the development of water freight in the EU (EC, 2014).

In the UK, water freight is a substantially underutilised mode and as per the 1968 Transport Act the nationalised waterways' main function is recreation (Defra, 2000). Even though the UK government has taken many initiatives as part of its policy to promote water freight such as FFGs, WFGs, an aggregate levy sustainability fund for waterborne aggregate transportation, a single window operation at the DFT for waterway freight issues, etc the government

attitude towards water freight as being primarily for leisure and recreation is not beneficial to the development of water freight (IWAC, 2007). Unlike in the EU and US, encouraging more freight traffic on inland waterways in the UK largely depends on the potential future demand for these movements in its waterways (DFT, 2004). An attitude to depend only on potential future demand for using water freight will not be the right promotional tool to encourage better usage in the UK.

However, being a partner of many water freight promotional projects in the EU such as Motorways in the Sea, TEN-T, etc UK got an opportunity to realize the importance of water freight. All these programmes are aimed to introduce new intermodal maritime-based logistics chains and maintaining and improving the image of IWT as an environmentally friendly mode of transport to reduce emissions. These aims must be considered as very significant and greatest reasons for promoting the wide use of water freight transportation within the UK. Experiences of working and developing different IWT programmes with the EU could be exploited to start similar projects in the UK. Even though the River Thames plays a role in London's freight movements, it is insufficient to develop a new integrated intermodal maritime-based logistics network in the UK.

There are possibilities to transport goods using waterways, even though the logistics industry still depends largely on roads. A well-designed transport infrastructure is fundamental to the shift of goods from road to sea because it contributes to reducing goods transit time. The concept of intermodal transportation needs promoting by the industry as the ultimate solution to achieve efficiency and competitiveness with less external costs. To ensure that water freight has a safe place in intermodal transportation its service reliability must be improved. This factor will determine the future of water freight in the region. Also, the shippers and receivers should be educated about the value of water freight. Promotion of freight transport by water requires active policy formulation, effective development control, partnership and promotion by the public sector. Proper planning includes the protection of existing wharves and freight transport facilities and promotion of new wharves and facilities.

The policy initiatives must give proper attention to the preparation of guidelines for customs procedures, identification and elimination of obstacles, and technological development. The literature review helped to establish that only SSS and coastal shipping are practical in CAD. To achieve a strong SSS requires a systematic analysis of the existing situations in the industry. The critical success factor for SSS is that it must facilitate cargo movement as an inexpensive, unbroken component of an integrated, intermodal transportation system. Detailed market assessment of SSS, case studies of existing developed SSS activities, a list of desirable characteristics for ports interested in attracting or enhancing SSS activities, enhanced existing SSS education and outreach efforts, and continued engagement of SSS stakeholders are some suggestions to be considered. Further, in depth knowledge about the costs of SSS and a greater understanding of the complementary interests and relationships among the various transportation nodes is needed (Lombardo, 2004; Sauri and Turro, 2013; 1-95 Corridor Coalition, 2005).

Suggestions to improve waterborne transportation by the DFT should be considered seriously. New land uses that require planning permission should be encouraged to use water transport and waterside sites should not be available for businesses which do not benefit from access to water transport. The corridor concept along the length of a waterway with potential for transportation use is appropriate where dry docks are available. To promote greater use of coastal waterways, there should be an acceptable multimodal transit time, administrative simplicity, reliability and frequency of coastal sailings need to be improved, with door to door multimodal services and seamless integration of transport modes. A multimodal chain with efficient and cost-effective land legs will make coastal shipping viable. (CII, 2013; DFT, 2004).

All the above-mentioned suggestions are effective in the promotion of water freight in the UK. However, major challenges identified from the literature review (section 2.8) need special attention to explore solutions based on the prevailing circumstances. Local solutions must be investigated to challenges such as lack of sufficient port infrastructure and hinterland connectivity, lack of support and promotion from the government, DFT and EU, insufficient tax

incentives and subsidies, regulations on marine traffic, attitude towards water freight, weather and tidal constraints, inadequate public investment, market demand and speed, cost, frequency and reliability of water freight services(IWAC, 2007 ; Li and Notteboom, 2011; CII, 2013; Valois et al, 2011; Sea and water, 2007). The challenges that waterborne transportation is facing must be addressed properly by central government and local governing bodies.

The literature review also identified many factors which influence the promotion of water freight. These include the stakeholders, professionals in the shipping and logistics industry, environmental benefits, local authority, economic benefits, population density, marketing of water freight and public opinion (Defra and DFT, 2002; Cornwall Council, 2012; Devon County Council, 2004; EC, 2013; Packer, 2004; Bonnerjee, et al, 2009). The role of governing bodies is an important factor in deciding the future of water freight in the SW UK. Transport policies of county councils should properly mention all opportunities and challenges water freight face and take initiatives to create awareness in the industry. Although CAD county councils formed maritime policies for the betterment of ports in the region, recent DFT statistics on water freight transportation showed only two major ports in this region. In this situation, one of the main objectives of this study is to find the challenges which prevent the usage of waterways in CAD.

This research is an attempt to find the potential for water transportation in CAD and how waterways help the logistics industry to transport goods, services and information without disturbing the environment and to evaluate the contribution that water transport can make to the logistics industry to become green in their operations. Although previous studies offered many suggestions and practical solutions to improve waterborne transportation in various parts of the world, this research identifies what is possible in CAD regarding water freight. This research contributes significantly to the industry, and to the academic field by opening a new insight into the possibilities of less considered waterways as a sustainable mode of transport with practical recommendations for becoming a cleaner industry.

However, the lack of relevant current literature on water freight in the SW UK impedes assessment of the importance of water transport in the region. Inadequate academic studies is a barrier in providing reliable, authoritative, well written, well referenced facts. The available information on water transportation published by the different maritime shipping organisations and government departments related to transport is mostly industrial and commercially based. The published list of the quantity of goods transported from each port provides little information about the potential of these ports in conducting different kinds of water transportation. This study aims to fill the gap in the literature by analysing various impediments to wider use of waterways and to suggest possible solutions to overcome these issues and challenges.

The literature review generated extensive data. Factors that influence water freight movements and challenges to be overcome in improving water transportation are key concerns. A conceptual model is needed to guide identification of key factors, key issues and what information to analyse. The conceptual model guides development of the research methodology and links study objectives to items identified in the literature review. The conceptual model is presented in the next chapter.

Chapter 3. Conceptual model

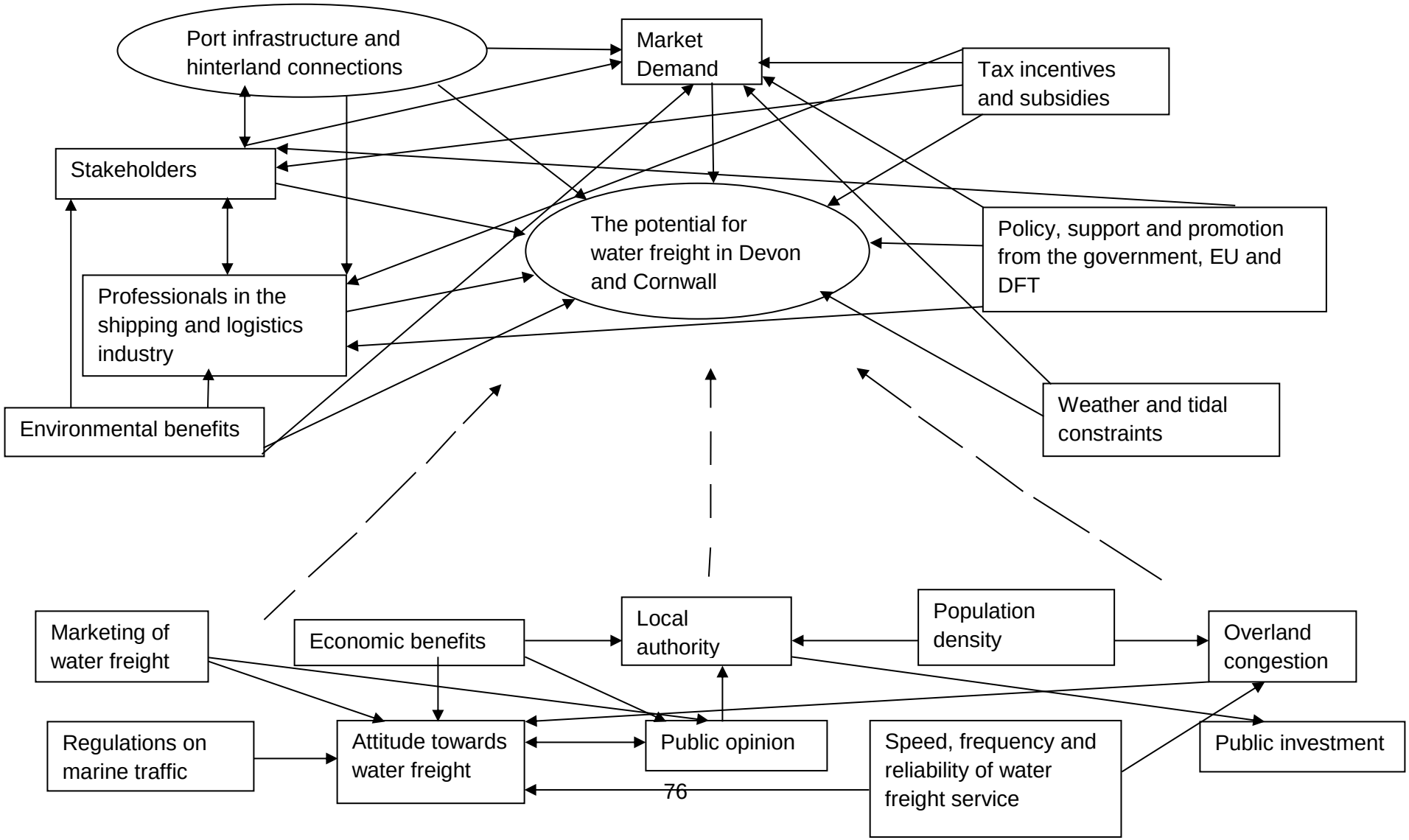
The previous chapter reviewed different aspects of water freight to the industry and society. The literature review was conducted as per the objectives set for the research. The relationship between the literature review and the objectives of the study are clearly illustrated by forming a conceptual model.

3.1 A conceptual model on the potential for water freight in CAD

A conceptual model helps the researcher to understand the research problem in various dimensions. According to Kitchin and Tate (2000: 33) a conceptual model is a “diagrammatic version of a theory which demonstrates process, concepts and relationships”. In the opinion of Miles et al, (2014) a conceptual framework explains, the main things to be studied, the key factors, variables or constructs and the assumed interrelationships among them in graphical or narrative form. Conceptual models combine all factors contributing to the problems, which describes how one conceives or make sense of relations between several factors important to the research problem (Sekaran 2009). A conceptual model helps the researcher to decide which variables are most important, the most meaningful relationships and what information should be collected and analysed (Miles et al, 2014). In other words, it links the objectives of the research, literature review and issues which should arise from the literature review. Conceptual models bring out relationships between objectives of the research and issues, which inevitably leads to the formation of the most suitable methodology for making solutions for the issues. This research focuses on the potential for water freight in SW UK. The objectives and literature review on the subject area helped the researcher to generate a clear idea on the main things to be studied, the key factors, variables and interrelationships among them (figure 3.1).

Figure 3.1 Conceptual framework for the potential for water freight in CAD and major influences on it

Source: authors own



The conceptual model on the potential for water freight in CAD identified the people (stakeholders, professionals in the shipping and logistics industry, etc.), and the things or official documents/policies (port infrastructure, hinterland connections, tax incentives, etc.) which are influential on it. The factors have different levels of influence on the potential for water freight in SW UK. Accordingly, their arrangement and the arrows of influence are different. The key factors are arranged at the top of the display with normal arrows and factors with moderate influence listed at the bottom of the display, with dashed arrows towards the major boxes. The key factors identified in the conceptual model are port infrastructure and hinterland connections, professionals in the shipping and logistics industry, stakeholders, environmental benefits, policy, support and promotion from the government, EU and DFT, weather and tidal constraints, tax incentives and subsidies and demand. The factors which have moderate influence on the potential for water freight in CAD are public investments, regulations on marine traffic, economic benefits, harbour size, population density, marketing of water freight, public opinion, attitude towards water freight, speed, frequency and reliability of water freight service, local authority and overland congestion. Each factor is explained briefly below.

3.2 Factors which influences the potential for water freight in SW UK

3.2.1 Port infrastructure and hinterland connectivity

The geography of SW UK has the potential to assist water freight, if there is sufficient port infrastructure, road and rail links to ports. Currently, lack of infrastructure at the ports of CAD causes underutilization of water freight. Ports in CAD need infrastructure upgrade and investments in port facilities. The rail and road infrastructure to support ports is also deficient and connecting hinterland connections are poor in the region. Additional facilities at the ports and connectivity outside the port area would assist efficient and effective functioning of water freight in CAD.

3.2.2 Stakeholders

Stakeholders of water freight include everyone who has interests in water transportation including logisticians, freight forwarders, exporters, shippers, media, politicians, pressure groups, the public and local authority. Stakeholders have a great role in the development of water freight in CAD. They can influence each other either positively or negatively for developing more opportunities for water freight. Media and politicians can easily inspire the public by publishing news and opinion about water freight. At the same time pressure groups could force the local authority for more public investment in developing basic infrastructure needs for the smooth functioning of water freight at the ports. Professionals in the shipping and logistics industry have more knowledge about the benefits of water freight so they can market water transport among the users of it easily. Competitive cost and environmental benefits of water freight will attract many if the marketing of water freight is conducted properly. The selection of appropriate modes of transport greatly depends upon the stakeholders' interests, knowledge and experiences on different means of transport. Sharing the experiences, knowledge and interest of water freight among stakeholders assist in influencing their decision on the selection of water freight.

3.2.3 Environmental benefits

Generally, water transportation is located away from the population centres, so the emissions from barges and vessels are less disturbing than from other modes of transportation. West Midlands Freight Strategy (2013) says that the carbon emissions from water freight are low compared to road and rail freight, which are 63% lower than for road and 25% lower than for rail. A study conducted by Mihic et al, (2011) found that water transport if conducted properly, does not threaten the environment too much; it does not produce waste, it does not cause much pollution, and it does not harm the view of the landscape, which can fully retain its characteristics. The environmental benefits offered by water freight are strong reasons to promote water freight in CAD.

3.2.4 Policy, support and promotion from the government, EU and DFT

As a sustainable and underutilized mode of transport, water freight in CAD needs more support from the government, EU and DFT. Policies and announcement of incentives in favour of the development of water freight by the government, EU and DFT usually attract more potential users of water freight in to the industry.

3.2.5 Tax incentives and subsidies

The usage of water freight incurs additional costs such as double handling, modal transfer, expensive feeder services, costs of transhipment, costly short sea shipping, etc. In such situations offers of tax incentives and subsidies will attract and help potential users of water freight to meet the extra costs of using it.

3.2.6 Professionals in the shipping and Logistics industry

Effective marketing of water freight and information sharing by the professionals in the shipping and logistics industry among the stakeholders of water freight is necessary to increase the use of it in the region. The benefits of using water freight compared to other modes of transport can be easily communicated to the potential users of water freight by the professionals in the shipping and logistics industry. It will help the potential users of water freight to think about water transport and make well-founded views of it other than road and rail.

3.2.7 Demand

At present water freight in CAD is used for the transportation of wet and dry bulk cargoes. The use of water transportation increases when there is a rise in the demand for more cargoes to transport using water freight.

3.2.8 Weather and tidal constraints

Many ports in CAD cannot accommodate large shipments of cargo because of draught requirements. Water freight depends upon weather conditions, so it is unreliable by nature. Tidal constraints and weather conditions limit commercial viability of water freight in the region.

3.2.9 Local authority

An increase in the usage of water freight creates more local and port jobs and local distribution opportunities. As a result, there will be a rise in the investments in the area. Proper functioning of water freight offers environmental benefits and economic prosperity to society. To achieve all these benefits, local authorities have a great role in developing policies and giving financial and legal support for making sufficient infrastructure to strengthen water freight. CAD has developed suitable policies for the betterment of ports and transport in these two counties. Devon County Council has taken a policy to protect and improve existing ports for better functioning and to develop a sustainable environment. Thus Devon Structure Plan 2001 to 2016 transport policy TR1 suggest that, Devon travel strategy promotes the development of more effective and integrated transport and freight networks, port facilities and their associated infrastructure should be maintained and developed in order to ensure the ports fulfil their strategic function: Plymouth as a commercial and fishing port linked to the European transport network, Teignmouth as a commercial port, Bideford as a commercial port and Brixham as a fishing port (Devon County Council, 2004).

The Cornwall maritime strategy has taken different policies for the well-functioning of its ports and harbours. Major policies understand the strengths, issues and opportunities in relation to harbours and ports, ensuring port infrastructure and waterfront locations are part of regeneration, protect and develop port infrastructure, promote port development for the expansion of other economic activities such as fishing, freight handling, ship repair, yacht and boat construction, and promote the role of Cornwall's large and small ports and harbours in creating job and business opportunities (Cornwall Council, 2012).

3.2.10 Public investment

Water freight needs sufficient infrastructure at the ports and hinterland to assist its service. The development of infrastructure is very expensive. To meet the cost

of infrastructure developments, public investment is crucial. The availability of public investment will encourage the use of water freight in the region.

3.2.11 Marketing of water freight

Along with the improvements in infrastructure for the smooth running of water freight, marketing of the benefits of water freight is important to attract many non-users of it in the industry. Effective marketing will be helpful to convince potential users of water freight to try this mode of transport for their future delivery.

3.2.12 Overland congestion

Water freight is the right option to avoid overland congestion created by heavy goods vehicles (HGV). Water transport can carry large amount of cargoes in one go compared to HGV's potentially removing huge numbers of HGV's from the roads and in turn reducing road congestion.

3.2.13 Attitude towards water freight

Developments in road and rail transport in the early twentieth century made water freight less attractive to users and to society. Many factors had influenced the fall in popularity of water freight such as its dependency on weather, slow movements, just in time concept, door to door delivery, media, etc. As a sustainable mode of transport, water freight can overcome all the limitations by offering many advantages over road and rail transport using modern ships and barges. The unhealthy changes in the environment due to pollution from different means of transport created a positive attitude among the public towards water freight, as a most sustainable mode of transport. The public has better information about the importance of a non-polluted environment in their daily life. The advantages of using water freight to the environment motivate the public to keep a positive outlook towards water transportation. In the past people are less conscious about the role of environment in their life. Now, easy access to information with the help of different media supports them to update their knowledge and raise their voice for the well-being of society physically and mentally.

3.2.14 Economic benefits

Ships carry more goods than road transport and the cost of transportation can be reduced as the volume of commodity and travel distance increase. Usually ships discharge goods much closer to the final location cutting out a large amount of the travel time and distance which could reduce the overall transport costs. An increase in water freight could lead to more employment opportunities in ships, ports and in the locality. This helps to improve economic growth in the region.

3.2.15 Population density

When population in a region increases demand for goods and commodities will naturally increase. Water freight is considered as a green alternative to road and other modes of transport. In such a situation an increase in demand for large quantity of cargoes encourages an increased use of water transport to enjoy all the benefits that water transport offers.

3.2.16 Public opinion

A strong public opinion in favour of the use of water freight is an important promotional tool for the development of water transport in the region. Media plays a significant role in the formation of public opinion about water transport. An increasingly environmentally conscious public is likely to be more receptive to the benefits of water freight and its popularity is likely to rise.

3.2.17 Regulations on marine traffic

Most of the regulations on marine traffic are safety and environmental related. A clear understanding of the range of legislation and measures are very important to follow them as intended. Standardisation of port entry requirements simplifies the entire process and would encourage more companies into water freight.

3.2.18 Speed, reliability and frequency of water freight service

Water freight is slow compared to other mode of transports. At the same time water transport can carry large quantity of cargoes in each journey. The economies of scale in carrying goods for a long distance are the most important quality of water freight. Weather has an influence on water transport but frequency of its service can be managed efficiently and effectively with the help of modern technology and vessels.

Since the use of water freight is more limited in the SW compared to other regions, seeking experts' opinions and suggestions on the existing and future use of water freight in CAD was instructive. The formation of a conceptual model revealed that the key factors and the assumed interrelationships are important for finding solutions for the research problem. The experts' opinions on the key factors and their interrelationships helped to analyse the situation without any predetermined views. A flexible approach to collect maximum possible information from the experts in shipping and logistics field is necessary for this. Such a method of data collection provided enough freedom for participants to express their views and knowledge on the research topic without any pressure. Since this is an exploratory research, the best qualitative approach can be used for the data collection is the Delphi method.

There are many other reasons to support the selection of the Delphi study as the data collection method. The Delphi study is flexible. It allows the participants to review the feedback of each round of the Delphi survey and is flexible enough to accommodate changing views. The Delphi study encourages every participant to conduct a debate on the research topic and thus brings out more information from them. The experts were given sufficient opportunities to express their individual comments on the topic of discussion. Since the selected participants of the Delphi study are experts in their respective field of work, there was no compromise on the quality of the information received from them. This helped the research to focus more seriously on the issues raised during the Delphi study. As a method

of forecasting, the Delphi study presents the research topic in a broader perspective. The experts' opinions, knowledge, experiences and insights on the research topic gave a very clear picture on the future of the topic of discussion. As a result, a better analysis of the research problem is possible by using the Delphi study as a method of data collection.

In the next chapter, the process of methodology selection was discussed based on the nature of the research question, objectives, literature review, main issues, the characteristics of the chosen research method, limitations of the method and a description of the research method used in shipping and logistics research.

Chapter 4. Methodology Selection and Discussion

The purpose of this section is to recognize the aim of the research objectives through the methodological methods. Methodology is defined as an overall approach to the research process which answers questions covering the need to collect data, what data are needed, from where it is collected, when it is collected, how it is collected, and how it is analysed (Collis and Hussey, 2003). Research methodology is a description of research activities for collecting data through the best possible ways to achieve the research aims. According to Silverman “like theories, methodologies cannot be true or false only more or less useful” (1994:2). The following part of this chapter explains the most suitable research methodology selected in terms of meeting the objectives of the research, its limitations and a detailed discussion of its importance in this study.

4.1 Methodology Selection

The research objectives of the study are the most influencing factor in terms of selection of the research methodology. An analysis on the research objectives leads to an inductive approach to conduct this project. In the inductive approach, from the collected data a theory is developed. Induction places an emphasis on gaining an understanding of the meanings humans attach to events, a close understanding of the research context, and a more flexible structure to permit changes of research emphasis as the research progresses (Saunders et al, 2009:127). Thus an inductive approach helps to understand better the nature of the problem. A research design is important at this stage to gain insights to the research objectives. According to Smith et al, (2008) a research design is a statement written, often before any data is collected, which explains and justifies what data is to be gathered, and how and where it should come from. It also needs to explain how the data will be analysed and how this will provide answers to the central questions of the research.

The research design of this study is exploratory in nature. Exploratory research is flexible and adaptable to change. The aim of exploratory research is to provide a better understanding of a problem, when the researcher is unsure of the precise nature of the problem (Saunders et al, 2012). It has been mentioned before that there were very few academic studies conducted on the research topic, so the exploratory research design offers proper guidelines to meet the objectives of the research. In exploratory research both secondary research and qualitative approaches are used for data gathering. Review of literature, informal discussions, and formal approaches like interviews, focus groups, projective methods or case studies are important sources in search of data (Sekaran and Bougie, 2013).

The current research uses a review of the literature, which includes description of water freight, statistical data on cargo throughput, imports, exports, employment levels, and government or private related organisations statistics. This information is used to support any possible findings in this research. However the use of experts' opinion on many issues of water freight is inevitable in realizing the objectives of this study. The exploratory research design offers informal discussion and formal approaches such as interviews and focus groups to collect data from experts. These methods have their own merits and demerits in collecting data. In the present research, conducting informal discussions with experts sometimes may not be substantial enough and supportive of the research intentions. An informal talk always consumes a lot of time before discussion of the more important issues. Since the topic of the research requires a serious discussion to contribute to its objectives, informal discussions are not suitable substitutes for other formal approaches of data collection methods.

In the following sections he advantages and disadvantages of interviews and focus groups as formal approaches and the importance of these data collection methods in meeting the objectives of current research are discussed.

4.1.1 Interview

“The research interview is a purposeful conversation between two or more people, requiring the interviewer to establish rapport, to ask concise and unambiguous questions, to which the interviewee is willing to respond and listen attentively” (Saunders et al, 2012: 372). Interviews help to collect valid and reliable data when asking relevant questions on a research topic. Interviews are of different types including structured interview, semi-structured or unstructured or in-depth interview and conducted face to face, by telephone or online. In structured interviews the questions are predetermined and standardised. Answers to each question are recorded on a standardised schedule. Semi-structured interviews use some key questions and a list of themes during interviews. Its uses may vary from one interview to another. It also contains some comments to open and stop discussion. Unstructured interviews are informal in nature and are used to explore in depth a general area (Saunders et al, 2012). The main advantages of interviews are: there is a chance to establish rapport and motivate respondents, opportunity to clarify questions, clear doubts, ask new questions and read non-verbal clues, and rich data obtained. If it is a telephone interview, advantages include less cost, they help to reach a wide geographical area, and take less time to complete and with greater anonymity than personal interviews (Sekaran and Bougie, 2013).

Although the interview has many advantages in data collection it also faces many short-falls while collecting data. The disadvantages include: availability of people with knowledge in the research area to be interviewed; sometimes respondents are reluctant to speak; it takes personal time; it is costly to conduct personal interviews in a wide geographic region; respondents may be concerned about the confidentiality of information given; and to interview experts in the research topic requires trained interviewers for to reap the best outcome. When conducting a telephone interview the limitations are: interviews need to be kept short; less chance to create rapport with the respondents; no opportunity to understand non-verbal clues; and respondents have the freedom to terminate the interview at any

time (Sekaran and Bougie, 2013). The possibility for these drawbacks to affect the reliability of research findings in different circumstances is undeniable. If respondents including experts in the research topic are reluctant to be interviewed or if there are insufficient number of experts to be interviewed and if they are concerned about the confidentiality of the information given, then all these issues affect the success of the research. Another serious issue is that, the respondents who need to attend the interview are geographically dispersed in a wide area, those further away may take a disproportionate part of the researcher's predetermined programme time. In order to save time, if the interviewer cuts short the duration of interview this may deny getting sufficient data from the interviewee. In these circumstances interviews are not an ideal data collection method for current research.

4.1.2 Focus Group

A focus group is a group of people consisting of six to ten participants and a moderator leading the discussion for 90 minutes to two hours on a particular topic, concept or product. Members are selected on the basis of their proficiency in the subject area to be discussed. Participants are encouraged to discuss and share their point of view without any pressure to reach a consensus (Cooper and Schindler, 2014). The aim of conducting a focus group is to get respondents' impressions, interpretations and opinion as the members discuss about the subject. The unstructured and spontaneous responses are expected to reflect the genuine opinions, ideas and feelings of the members about the topic under discussion. The moderator has the responsibility to control the discussion in a manner that draws out the information sought and keeps the members on track (Sekaran and Bougie, 2013). Advantages of this method are, the focus group is relatively inexpensive and it can produce fairly reliable data within a short time.

There are a few things to take care of when conducting a focus group. Participants have their own freedom to express their opinion, proper care should be given to participants to keep their confidentiality, participants should have similar status

and work experiences to avoid dominance of certain individuals, to encourage everyone in the group equally, ensure each participant understands others' contributions correctly, and finally conduct focus group in a natural setting where participants feel relaxed (Saunders et al, 2012). According to Krueger and Casey (2009) three or four focus groups with one type of participant is necessary to reach saturation where a full range of ideas are collected from participants. Making key points, notes and managing the flow of ideas in a focus group can be achieved through using audio-recording group interviews or using two interviewers (one facilitates discussion and the other takes notes) (Saunders et al, 2012).

When considering a focus group as the data collection method in the present research, some of the requirements of focus groups may affect the smooth running of data generation. It is very difficult for this study to conduct focus group, three or four times with the same participants of similar status and work experience since its respondents are not in the same status or work experience and there is no guarantee that all the participants of first focus group can present for the last one also. The research time schedule may be compromised if focus groups with different status and work experienced participants are conducted seperately by categorising similar status and work experience together for all three or four rounds. Participants of the present study are placed geographically in a wide area. In such a situation it is difficult to bring each of them every time for the focus group, in a common meeting place.. Given these issues, deployment of a focus group strategy requires careful planning.

4.2 Delphi

Exploratory research methods offer another qualitative approach for data gathering which is the Delphi technique (Stevenson, 1990; Michael et al, 2004). It is a method of inquiry, a useful communication tool to achieve consensus in a given area of uncertainty and provides more accurate assessment obtained either by individuals or by interacting groups (Delbecq et al, 1975). The present study aims to gather experts' comments to reach a general agreement to fulfil the objectives of the study. The research requires a structured technique which

enables participants to communicate on a serious issue to obtain the most reliable consensus from a group of experts. As an exploratory research method of data collection, the Delphi technique motivates independent thoughts and gradual formation of group solutions and assist decision making (Landeta, 2006). Thus by facilitating group communication among the anonymous participants upon a complex problem a group consensus can be achieved over a sequence of iterations (McKenna, 1994). A series of intensive questionnaires with controlled feedback are distributed to collect experts' opinions. Summarized responses from the questionnaires are communicated back to respondents until consensus is reached (Hasson et al, 2000). This data collection method has many advantages compared to the other two qualitative research data collection methods discussed before, interview and focus group. The Delphi method is a quick, cheap and comparatively efficient way to combine the knowledge, skills and experiences of a group of experts anonymously to the decision making process without any geographical limitations (Everett, 1993; Jones et al, 1992; Lindeman, 1975). These advantages of the Delphi method helps the current study to overcome many of the limitations in data collection and to succeed in attaining its objectives. A detailed analysis of the Delphi technique as a data collection method is presented below

4.2.1 The Delphi Method

According to Linstone and Turoff, the Delphi technique is defined as a "method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem (Linstone and Turoff, 1975, p: 3). This method was developed at the RAND Corporation to improve the use of expert opinion in policy making after the Second World War (Loo, 2002). The Delphi method is named after the ancient Greek oracle, at Delphi who had a network of most truthful informants, and forecast the future to those who sought advice before dealing with major courses of action (Dalkey, 1972). The first experiment of Delphi was implemented in 1948. The

technique gained its popularity only after the publishing of the first article describing the Delphi experiment in1963 (Gupta and Clarke, 1996). Today it has become an important instrument in making predictions and decision-making and a well-recognised group process in the social sciences. The aim of the Delphi experiment is to obtain the most reliable consensus of opinion from a group of experts by means of a series of intensive questionnaires with controlled feedback (Landeta, 2006). According to Rowe et al, 1991 Delphi offers a democratic, structured approach and participant anonymity in order to produce more accurate assessments or judgements in a decision making process. It has a flexible design and is open to follow-up interviews. This allows the collection of richer data from participants leading to a deeper understanding of the fundamental research problems (Okoli and Pawlowski, 2004).

4.2.2 Types of Delphi

The Delphi method was originally used to get the most reliable consensus of opinion from a group of experts using repeated questionnaires with controlled feedback. When many authors try to define the usefulness of the Delphi method using more descriptive labels, several different types of Delphi methods can be identified (Jackie, 1997). According to Keeney (2009) there are ten main categories of Delphi. They are classical, modified, decision, policy, real time, e-Delphi, technological, online, argument and disaggregative policy Delphi. The aim of classical Delphi is to gain consensus and experts selected based on aims of research. The modified Delphi method helps to predict future events and achieving consensus. Decision Delphi aims to structure decision-making and creates future in reality instead of predicting it. The aim of policy Delphi is to generate opposing views on policy and potential solutions. Real time Delphi is using computer technology to achieve consensus in real time than post. Administration of e-Delphi is through email or web survey and follows the process of classical Delphi. The technological Delphi method uses hand-held keypads which help to record responses and to provide instant feedback. The online Delphi

method implements the technique on any online instrument such as chat room, or forum. The argument Delphi technique aims to develop relevant arguments and explain underlying reasons for different opinions on a specific single issue. The Disaggregative policy Delphi is meant for constructing future scenarios in which panellists are asked about their probable and preferable future (Hasson and Keeney, 2011).

4.2.3 Characteristics of the Delphi method

The Delphi method is a group process, administered by a researcher or a research team and a panel of experts creates feedback and leads the group towards common ground. It uses recursive rounds of sequential surveys interspersed with controlled feedback reports and the interpretation of experts' opinion to organize conflicting values and experiences in to consensus (Donohoe et al, 2012). The Delphi method has five major characteristics. They are expert panel, anonymous participants, duties of moderator, iterative process and final outcome (Loo, 2002).

Expert Panel

In a Delphi method the sample consists of a panel of carefully selected experts on the basis of their knowledge about the study topic and their interest in the aims of the study. The expert panel is the most essential components of a Delphi study (Jackie et al, 1997). The success of a Delphi study undoubtedly depends upon the participants' expertise. So the Delphi method requires subject matter experts as its panel of respondents. They present a broad range of opinion on the topic or issue being examined. The selection criteria include knowledge on the topic, personal experiences or being stakeholders. There is no one sample size encouraged for Delphi studies (Loo, 2002). The number of participants may fluctuate according to the scope of the problem and resources available. The two influential resources are time and money. According to Murphy et al (1998) as the number of participants' increases the reliability of a combination of judgement

increases. Experts from varied backgrounds, personalities and different perspectives on a problem typically produce higher quality, and highly acceptable solutions than homogeneous groups (Delbecq et al, 1975).

Anonymity of panel members

Participants are usually anonymous in a Delphi process. So the idea generation in the Delphi is individual based, anonymous and independent. Since participants record their opinion anonymously, this removes the peer pressure, dominance of some participants and powerful voice gaining more weight, among the respondents (Kennedy, 2003). There are no interpersonal conflicts and communication problems because panel members do not interact (Loo, 2002). Everyone in the expert panel gains equal importance for their opinion and any tendency for individual participant dominance is removed in the Delphi technique. The anonymous nature of the Delphi method also motivates panellists to revise their views when seeing the responses from experts, without publicly admitting what they have done. This assists them to take a more personal view-point rather than a particular organisation's position (Gupta and Clarke 1996). The responses of individual panel members are unknown to other panel members while they are known to the researcher. This allows the researcher to contact non-respondents to achieve a higher response rate (Tonni and Oliver, 2013).

Duties of the Moderator

The Delphi technique is a group method and has two major elements. They are the expert panel and the moderator or the researcher. The moderator is the administrator of the process. One of the important duties of the moderator is assembling a panel of experts for the study (Donohoe et al, 2012). Based on the topic of study a panel of subject matter experts is selected. The researcher informs the panel of experts that they have to attend several rounds of questionnaires and feedback which last for several months. A Delphi study usually involves three to four iterations. Every round of questionnaires consists of key issues for the expert panel to express their opinion (Okoli and Pawlowski, 2004).

It moves systematically from general to specific issues to address in successive rounds. The moderator prepares questionnaires based upon the study goals and a critical literature review. Both qualitative and quantitative analysis are conducted on returned questionnaires and feedback reports prepared for the panel and materials for the next round of questionnaires. The researcher continues surveying until criteria for consensus are achieved (Loo, 2002).

Delphi method is an iterative process

One of the key features of a Delphi method is iteration of the questionnaires. Usually it follows three rounds of questionnaires with a summary of the results of the previous rounds which are communicated to the participants (Dalkey, 1969). According to Truoff (1975) five rounds of Delphi may be necessary to meet all of its objectives. Sometimes the number of rounds may be lower if the researcher can reach a consensus with confidence in advance. Many researchers reported that answers are unlikely to change after two or three rounds (Mitchell, 1992) (Goldfisher, 1992). According to Donohoe et al (2012) the empirical point of stability regarding consensus of decision making is usually reached after the fourth iteration of responses. Each round of interaction with questionnaires offers the expert panel an opportunity to replicate their initial judgements, collect required information and a chance to change their responses on the basis of feedback from other panellists (Jackie et al, 1997). The initial questionnaire mostly collects qualitative comments, on the issue to be addressed in later rounds which is summarized and communicated back to the respondents through a process of controlled feedback. Thus results from one round of questionnaire assist formulation of the next round questionnaire. This process is repeated until consensus is reached or the number of responses in each round decreases (Hasson et al, 2000).

Outcome of the Delphi method

There is no consistent method for reporting findings in a Delphi method (Schmidt, 1997). Usually the findings are in the form of a research report with the Delphi

results, the forecasts, policy and programme describing their strengths and weakness, recommendations to senior management and possibly action plans for developing and implementing the policies and programmes (Loo, 2002). The other ways of presenting results of Delphi methods are graphical representation and the textual representation of statistical results showing central tendencies, variance and ranks (Woff et al, 1996) (Chocholik et al, 1999). The presentation of findings with summarized findings of the subsequent rounds shows the relative standing of each of the opinions of experts in the panel. The final outcome of a Delphi survey represents the opinion of every member of the group. When presenting statistical results, readers must be informed how to interpret the results and how to understand findings in relation to the emphasis being placed upon them (Hasson et al, 2000).

4.2.4 Advantages of the Delphi method

A Delphi method is a social research technique used to obtain a reliable group opinion using a group of experts. In other words it is a method of organising communication between a group of people who are able to provide valuable contributions to resolve a complex problem (Linstone and Turoff, 1975). The main advantage of the Delphi method is the achievement of consensus when there is uncertainty or lack of empirical evidence in the given topic (Murphy et al, 1998) (Delbecq et al, 1975). Selective feedback of the relevant information, more extensive consideration due to the repetition, statistical results, flexible methodology, simple execution and valuable solutions to the traditional direct interactional group methods problems such as inhibition, and dominant personalities, helped the Delphi method to become a widely used technique (Landeta, 2006). Participants of a Delphi method bring a wide range of knowledge and experiences to the decision-making process. At the same time each feedback between rounds increases the knowledge level and arouses new ideas in participants (Pill, 1971). The anonymous feature of the Delphi method offers an opportunity for the experts to express their opinions and knowledge anonymously,

free from constraints of personality conflicts or status relations about a complex problem and to watch how their views align with others and if needed they can change their opinion after reconsideration of the findings of the group work (Keeney et al, 2001).

The Delphi method is flexible in nature. This allows the researcher to adapt the technique to the research context. The data collection tool - the survey, enables the researcher to collect both qualitative and quantitative data. A well designed questionnaire needs much less effort for a participant to respond. The flexibility in the design phase of the survey enables gathering of a rich and varied data set. Thus the validity of the data and outcomes are improved (Donohoe et al, 2012). The systematic procedures of the process offer objectivity to the outcomes. Another advantage of a Delphi method is that it does not demand proximity of the participants with the researcher. The expert panel can participate in the process without any geographical limitations. Thus travel costs and problem of coordination to get everyone to the same place at the same time in not an issue (Loo, 2002). It is a relatively inexpensive method to organise and administer (Gupta and Clarke, 1996).

4.2.5 Disadvantages of the Delphi method

As explained before, the Delphi method has many advantages, but these advantages sometimes become its limitations. In the opinion of Sackman (1975) anonymity, one of the key principles of the Delphi, and release from peer pressure, could lead to lack of responsibility and liability for responses. It may result in individual compromises instead of a genuine reflection of consensus by a group (Gutierrez, 1989). But this is not a limitation applicable only to the Delphi method, as it is common to any anonymous questionnaire data collection methods. Another drawback of the Delphi method is that it requires an extensive time period to complete its process. According to Jairath and Weinstein (1994) and Williams and Webb (1994), the duration and cost of the Delphi method depends on the scale of the survey, the complications involved in the processing of the

questionnaires and the number of rounds. Some other disadvantages applicable to the Delphi method are sloppy execution, inaccurately designed questionnaires, poor choice of experts, unreliable result analysis, limited value of feedback and consensus and instability of responses among consecutive Delphi rounds (Gupta and Clarke, 1996). These limitations can be overcome by proper understanding of the purpose of the research and research questions and process involved in the Delphi technique.

4.2.6 The Delphi method-How it works

The Delphi method is different from other data collection methods the way that it encourages honest opinions and avoids potential conflict inherent in face-to-face meeting. Its systematic control gives objectivity to the outcome and sharing of responsibility and ownership of the resulting decision promotes satisfaction among the respondents (Lindeman, 1975). The Delphi method can be used to collect reliable, accurate and feasible information where there is insufficient data on a topic (Tapio, 2002). A detailed planning and effective execution of the Delphi method is necessary to achieve its objectives. There are four key activities in the Delphi data collection method. They are problem definition; panel selection; determining the panel size and conducting the Delphi rounds (Loo, 2002).

Problem definition

It is the initial stage to identify the nature and scope of the problem to be investigated, expected outcome of the study, and the appropriateness of the Delphi method for the investigation of the problem. This involves discussion on the factors affecting the research, resources available and researchers' competency and skills (Hasson et al, 2000). Researching the background of the topic to be investigated, provides some theoretical factors of importance in determining the relative importance and scope of the study. The Delphi method is appropriate only when to explore or expose underlying assumptions or to find out information which can generate a consensus on the part of the respondent group

or to educate them about the diverse and interrelated aspects of the topic (Turoff, 1970). In the opinion of Reid (1988) the decision to employ the Delphi method as the methodology of any research depends upon the appropriateness of the available alternatives.

Panel selection

In the Delphi method, selection of qualified experts is a critical requirement. It is a group decision process that needs qualified experts who have deep understanding of the issues (Okoli and Pawlowski, 2004). The participants of the Delphi study are selected for a purpose to apply their knowledge and experiences to a predetermined issue which is under investigation. Experts from different backgrounds with widely varying personalities and significantly different perspectives on a problem lead to better performances and a wider range of alternatives (Murphy et al, 1998). There are two types of participants. They are Referees such as academics or civil servants and Advocates such as leaders of special interest groups (Critcher and Gladstone, 1998). When the respondents have agreed to participate in the study, they need accurate information on what is required of them, how long it takes and how proposed information would be used (Hasson et, al, 2000). These experts form different panels.

Panel size

The Delphi study has no one sample size encouraged, but rules of thumb says for a heterogeneous population it can use 15-30 subject-matter experts and five to ten for a homogeneous population (Martino, 1972). Turoff (1975) suggests that, a minimum of ten and a maximum of fifty on the expert panel are appropriate for conducting a Delphi study. Gibson and Millor (1990) suggested an initial list of 60 participants to produce 20-30 actual participants. The number of experts affect the potential for idea generation and the amount of data to be analysed. The panel size was fixed based on the complexity of the issue being studied, the range of expertize required to address the issue and the purpose of the study (Loo, 2002).

4.2.7 Conducting the Delphi rounds

The Delphi study consists of three or four rounds or iterations. In the classical Delphi, round one begins with an open-ended questionnaire which allows participants to complete it with freedom and generate ideas. In order to express the most important issues and opinions of the research objectives, respondents are asked for at least six opinions (Schmidt, 1997). Each round is prepared on the basis of clear identification of research objectives and a critical literature review of similar research activities (Loo, 2002). Round 1 can be used to address broad issues with an aim and the successive rounds to focus on specific key issue. Rounds two and three could be conducted to achieve consensus or goals. The round two questionnaire is made up from analysis of the results of round one, and round three is based on the analysis of the round two's responses (Hasson et al, 2000). The prepared questionnaires are administered using email, fax and the web. The expert panel can use any of these media as per their convenience. By using these rapid media they can speed up the turnaround time between questionnaires (Okoli and Pawlowski, 2004). Both qualitative and quantitative analysis are performed on the returned questionnaires. When criteria for consensus are achieved the moderator prepares a final report and distributes it among the members.

While sending the questionnaires a covering letter is important in the Delphi study. this is used to inform and motivate participants about participating in all rounds and returning their completed questionnaires in a timely manner.

4.2.8 Data analysis and meaning of consensus in the Delphi method

Data Analysis

In the Delphi technique, methods of data analysis vary according to the purpose of the Delphi study, structure of the rounds, types of questions and number of participants (Powell, 2003). Two important functions in data analysis are

examination of the collected data and careful management of qualitative and quantitative data. Usually data from the first round of the Delphi are qualitative and analysis can be done using content analysis techniques. The content analysis techniques are used to find out the major themes generated by the first round of the unstructured questionnaire. It involves presentation of the story, interpretation of its meaning, comparing the newly available data with what is currently known in practice, identifying new knowledge and supplied a structured questionnaire for the analysis and later comparison to the Delphi findings (Kennedy, 2003). If the research follows the classical Delphi method, it is not allowed to change the wording used by the participants and to add anything during analysis. It must use the listing items as much as possible for round two. The use of qualitative softwares such as Nud*ist or Ethnograph or Atlas.ti^{TM} often helps to organize and manage the transcribed data for qualitative research (Hasson et al, 2000). These programs help to build relationships among the concepts and evaluate their similarities and differences.

The second and following rounds of the Delphi study data being quantitative in nature can be analysed using ranking or rating techniques (Jairath and Weinstein, 1994). The analyses of the data collected from these rounds try to find out convergence and change of respondents' opinion or judgements. To find out the level of collective opinion requires the use of descriptive and inferential statistics. Central tendencies (means, medians and mode) and levels of dispersion are calculated to provide participants about information on collective opinion (Hasson et al, 2000). From the third round onwards participants should be informed of the central tendency and dispersion of scores of previous rounds. Participants also need information about their scores placed in relation to the overall picture. This provides an opportunity to revise previous scores in the light of the new score which is an important step in the move towards consensus (Powell, 2003).

Consensus in the Delphi method

Consensus is used to express the meaning of general agreement. Consensus is the core of the Delphi study since it provides the final conclusion to the entire process being conducted. The Delphi study has no firm rules to report when consensus is reached. In many Delphi studies consensus was defined in different ways. The most common one is setting a percentage level for inclusion of items and this appears to be a common interpretation even though one that is interpreted at different levels (Powell, 2003). The presentation of findings from each round are important and findings from subsequent rounds indicate the relative standing of each of the opinions. Usually the last round shows a union of opinion with dispersion of participants' views diminishing with each round (Linstone and Turoff, 1975). In the opinion of Butterworth and Bishop (1995) consensus is when a majority of the participants come to an agreement. According to Duffield (1993) consensus is defined as the stability of responses between rounds. A Delphi study conducted by Williams and Webb (1994) set 100% agreement for items to be accepted. In their opinion definition of consensus extends from true consensus to majority rules. Beech (1997) suggested that consensus is understood by the result. In some cases interpretation of consensus is entirely left to the reader. Thus achieving consensus in an area of uncertainty is an advantage of the Delphi method.

4.2.9 Reliability, Validity and Trustworthiness of the Delphi method

4.2.9.1 Reliability

"Reliability refers to the consistency of measurement within a study" (Lacey, 2010, p: 28). In other words it is the extent to which a procedure generates the same results under persistent conditions under all circumstances (Hasson et al, 2000). It has been sub-divided into three different types. They are (1) the degree to which a measurement given repeatedly remains the same (2) the stability of a measurement over time and (3) the similarity of measurements within a given

period of time (Kirk and Miller, 1986, p: 41-42). According to Gordon (1992); Ziglio (1996) and Clayton (1997) the Delphi method enhances reliability. They expressed their opinions based on two principles. The first principle is the feature of the Delphi method such as interactive nature, avoidance of group bias and the occurrence of group thinking scenarios which increases reliability of the results. The second principle says that as the panel size increases the reliability of the respondent group also increases. This principle is formed based on the belief that a larger group reflects the opinion of the population and provides a smaller confidence level.

To estimate the reliability of a procedure there are four main approaches. The first one is test-retest, in which a test is conducted on two different occasions to the same sample. In many studies the test-retest reliability measure has applied to examine the stability and equivalence of the Delphi research over time. For example, Uhl (1975) conducted a Delphi study among 26 university faculty members using a questionnaire containing of 110 items. An expert panel was asked their observation of the degree of importance given by their institution to different goals and their opinion on the degree of importance. Within three rounds consensus was obtained. After one year the same panel was asked to answer the same questionnaire. The results were closer to the initial Delphi round than the final one. This indicates the stability in panellists' opinions between the two Delphi signifying reliability. The second approach is internal consistency, which aims to assess the consistency of results across items within a test. The third is an inter-observer, and refers to the rating of the same information and the recording of consistent results by different testers. By employing inter-observer measures one can compare a panel's results from studies which started with the same information and includes experts with similar characteristics. The final approach is parallel form also known as alternate. This can be used when two different instruments are designed to test the same information and produce the same result (Patton, 2002; Manson and Bramble, 1989).

Even though the Delphi method has been criticised for a lack of reliability (Critcher and Gladstone, 1998), many Delphi users, like Ono and Wedemeyer (1994) reported that the result of a Delphi study which was conducted 16 years earlier and currently conducted on the same information reflected present findings which were accurate in terms of forecasting communication developments. From this example, the use of the Delphi method is still relevant where accurate information is unavailable or expensive or any other research approaches are unpractical due to the nature of the research problem (Linstone and Turoff, 2002).

4.2.9.2 Validity

Validity is divided into two types, external and internal. The external validity measures the generalizability of the findings and internal validity denotes the confidence placed in cause and effect relationships, normally proven by experimental research (Hasson and Keeney, 2011). Validity can be measured using content, construct and criterion of a construct. Content validity assesses whether an instrument provides adequate coverage to a topic under investigation. Construct validity measures the theoretical foundations of a scale or measurement and the suitability of the test in its meaning. Criterion-related validity is used when a test is shown to be effective in predicting criterion or indicators of a construct (McIntire and Miller, 2005).

According to Murry and Hammons (1995) and Meyrick (2002) the Delphi method is a valid instrument. There are three key assumptions to support the above statement. The Delphi study creates results from group opinion which is supposed to be more valid than a single person's decision. The process of the Delphi method is based on expert opinion from the real world giving confirmative conclusions on the subject. The first round of the Delphi study is an open qualitative one, and allows experts to generate scale items and the following rounds give an opportunity to review and judge the appropriateness of the scale (Cooke, 1989; Cross, 1999). Hence Rowe et al (1991) expressed their opinion as the validity of the Delphi method is influenced by the number of experts in a

sample and the level of expertise and agreement which the experts possess. To achieve construct validity in a Delphi study a researcher's interpretation and categorisation of round one findings must be sent back to the experts for checks to be done. This activity ensures that the experts definitions are correct and increase the possibility that the findings can be generalizable to different settings (Hasson and Keeney, 2011). The two types of criterion related validity are concurrent and predictive. Concurrent validity of the Delphi method is measured on the basis of the successive rounds as the panellists have identified and agreed the components (Hasson et, al, 2000) and predictive validity is often measured in terms of the accuracy of the Delphi (Gracht, 2008).

Evaluation of the frequency of the Delphi articles, dissertations and theses published from a period 1975 to 2004 shows validity of the Delphi method as a methodological tool. Gupta and Clarke (1996) carried out a search on the articles published from 1975 to 1994, in which the Delphi method was the main subject. The result was 463 articles, 254 of which dealt with Delphi as a main theme and the rest, 209 as a secondary element. Later Landeta (2006) continued this search from 1995 to 2004. They reviewed four databases: Science Direct, ABI inform, Medline and Psycho. The result shows a growing degree of use of the Delphi method in the light of the number of articles published (Table 4.1). A search in the ProQuest Dissertations and Theses database show that in articles and doctoral theses a growing use of the technique is observed and the scientific community has accepted the Delphi Technique as another research method with present day validity and use.

Table 4.1 Frequency of Delphi articles published from 1995 to 2004

Data Base	Period	Articles
Science Direct	1995-1999	367
	2000-2004	571
ABI Inform	1995-1999	47
	2000-2004	106
Psycho	1995-1999	86
	2000-2004	162
Medline	1995-1999	361
	2000-2004	547

(Source: Landeta, 2006)

4.2.9.3 Trustworthiness and the Delphi

Trustworthiness in a Delphi study is established through clear formulation of the research question, transcription of responses and detailed recording of response rates over successive rounds (Efstathiou et al, 2008). The four main strategies to begin trustworthiness are credibility, dependability, confirmability and transferability (Polit et al, 2001). Credibility of the Delphi method can be improved by ongoing iteration and feedback given to panellists, which can be viewed by members and by undertaking additional research methods (Zolingen and Klaassen, 2003). According to Cornick (2006) dependability can achieved by including a range and representative sample of experts in a Delphi study. By maintaining a detailed description of the Delphi collections and analysis process confirmability can be assessed. At the same time transferability can be established through the use of verification of the applicability of the Delphi findings (Kennedy, 2004).

4.2.10 Comparing the Delphi with Traditional Surveys

Table 4.2 compares the Delphi method to a traditional survey. A survey is a system for collecting information from or about people to describe, compare, or

explain their knowledge, attitudes and behaviour (Flink, 2003). The survey system consists of setting objectives for data collection, designing the study, preparing a reliable and valid survey instrument, administering the survey, managing and analysing survey data and reporting the results (Sekaran and Bougie, 2013). The questionnaire design is an issue to both research strategies. There many issues concerning validity of the questions the researcher must consider to develop a good survey. The questionnaire can include questions that ask quantitative or qualitative data (Okoli and Pawlowski, 2004). The key areas of the Delphi method and traditional survey compared here are sample, sample size, response, validity, anonymity and richness of data.

Table 4.2 Comparison of Delphi method with Traditional Surveys

Evaluation Criteria	Traditional Survey	Delphi method
Sample	A random sample is selected from the population using statistical sampling technique.	It employs a panel of informed individuals or experts
Sample size	The sample size is large enough to generalise results to a larger population	The literature demands 10-18 experts on a panel
Individual vs. Group response	The individual responses average out to determine the average response for the sample.	Questions requiring expert judgement, the average of individual responses is inferior to the average produced by group decision.
Reliability and response revision	Researches assure the reliability of measures by pretesting and by retesting	Pretesting is a reliability assurance for the Delphi method.

	to assure test-retest reliability.	
Construct validity	By careful survey design and by pretesting, construct validity will be assured	Construct validity is assured in Delphi method by asking experts to validate the researcher interpretation and categorization of the variables.
Anonymity	Respondents are almost always anonymous to each other and often to the researcher	Respondents are always anonymous to each other and not to the researcher
No response issues	Researchers need to investigate the possibility of non-response bias.	Non-response is typically very low in the Delphi method
Attrition effects	For single survey attrition is a non-issue. For multi-step, repeated survey researcher should assure that attrition is random and non-systematic.	Attrition tends to be low in the Delphi method
Richness of data	The richness of data depends upon the form and depth of the questions	The Delphi study gets richer data because of multiple iterations and experts response revision due to feedback.

(Source: Okoli and Pawlowski, 2004)

4.3 The Delphi method, in shipping and logistics research studies

Many organizations are using the Delphi method as a qualitative, long-range forecasting technique that elicits, refines and draws collective knowledge and experiences of experts in a given field, to improve decision making, policy analysis, planning and make predictions about the future in both the public and private sectors (Gupta and Clarke, 1996). Like any other industries, shipping and logistics industries are also affected by the probable and unforeseen developments of the future. Developing long-term strategies is the only way to get along with these unforeseen progresses in the socio-economic, political, technological and cultural field. Creating future scenarios and foresight analysis based on the judgement of experts are the bases for the development of long-term strategies (Gracht and Darkow, 2010). The Delphi is a frequently used method for long-range forecasting and effective group decision making. Many studies are conducted in the shipping and logistics field using the Delphi technique as the research methodology to answer several unforeseen problems and to generate consensus in various issues (Paz et al, 2014). The following section addresses some specific examples of the Delphi method in shipping and logistics related research.

In 1989 Ariel undertook a study to forecast issues relating to the dry bulk sector in the year 2000 using the Delphi method. In 1994 New and Tomlinson used the Delphi as a secondary source in the reality of possible supply chain integration. Fadda (1997) used the method to investigate Brazilian coastal shipping in 2010. Saldanha and Gray (2002) used the Delphi method to investigate the potential for British coastal shipping in a multimodal chain. In 2004 Hwang, used the Delphi method to undertake a comparative study of the logistics services in container liner shipping market in the UK. Islam et al, (2006) have conducted a study using the Delphi method to promote development through multimodal freight transport in Bangladesh. In 2010 Gracht and Darkow have conducted a Delphi based analysis on scenarios for the logistics industry for 2025. Cetin and Cerit (2010) used the Delphi method to assess the relative importance of the main

effectiveness criteria in sea ports. Brett and Roe (2010) investigated the potential for the clustering of the maritime transport sector in the Greater Dublin Region using the Delphi method. Duru et al (2012) used fuzzy-Delphi method for improvement of accuracy and introduced an empirical study on dry bulk freight market case. Dinwoodie et al (2013) investigated maritime specialists' perception on maritime oil freight flows to 2050 using the Delphi method. In 2014 Paz et al used the Delphi method to determine the constraints that affect the future size of large container ships and Dinwoodie et al (2014) have used a Delphi method to synthesize the perceptions of early career specialists regarding trends in dry bulk shipping flows to 2050.

It is evident that almost all data collection methods have some biases associated with them. As a solution for this issue in a research, collecting data through multi-methods and from multiple sources provides rigour to research. Hence, high associations among data obtained on the same variable from different sources and through different data collection methods lend more trustworthiness to the research instrument and to the data obtained through these instruments (Sekaran, 2003). Establishing the methodological rigour of the Delphi study is a vital aspect of this research to produce dependable results. The verification of Delphi findings clarifies and strengthen them, and helps to gauge the generalizability or transferability of the findings. Generally, interviews, focus group, nominal group technique and questionnaires have been utilised for the verification of Delphi findings (Hansson and Keeney, 2011). This research uses focus group to verify the findings of the Delphi study. A focus group with the members of the 'Maritime and Waterborne Innovation Group' in the SW UK helped to measure the trustworthiness of the Delphi findings on the potential for water freight in the SW UK.

4.4 Focus group

Focus groups are group discussions; consist of seven to ten members with a moderator, exploring a specific set of topics for about 90 to 120 minutes (Barbour and Kitzinger, 1999). Focus groups meet for a one-time group session aimed to obtain members impressions, interpretations and opinions on specific topic on which information is sought at a particular location and at a specified time (Sekaran, 2003). In focus groups, a moderator guides the discussion while a small group talks about the topic that the interviewer raises (Morgan 1997). This method allows participants to generate unstructured and spontaneous responses about the topic under discussion. Focus groups are ideal for exploring members' experiences, opinions, wishes and concerns in their own terms and vocabulary. Focus groups produce the best results when what interests the research team, is equally interesting to the participants in the group. As a result, the groups are much easier to analyse (Morgan 1998). There are three types of focus groups such as full group, mini-group and telephone group. A full group consists of eight to ten persons whereas mini-group contains four to six members. In a telephone group member participate in a telephone conference call from different locations (Greenbaum, 1998).

Focus groups play an important role as an ancillary method, alongside and complementing other research methods at the beginning, middle and end of projects. As an ancillary method, focus group use in pre-pilot work, as a contemporary extension of research methods, and method of communicating findings to research subjects (Bloor et al, 2001). Focus group as a secondary method helps to provide an interpretative aid to research findings, contextual basis for research methods, and generating new insights on the early findings of a research. This research uses focus group at the end of the project to present the Delphi study findings to participants and then facilitated focus group discussion about the findings to collect additional data which provide a stimulus to qualify, deepen and extend the initial analysis (Bloor, 1997).

4.4.1 Characteristics of focus groups

Focus groups are considered as a method for gathering research data from people. The researchers select the interview topics and focus group participants provide the data. Participants of a focus group are selected as per the needs of a particular project. Focus groups are more open-ended and flexible, to create concentrated conversations on a selected topic. The researcher encourages participants for a very active group interaction. Consequently, focus groups produce large amounts of intense data in a short period of time. Analysis of the data collected involves a process of listening and relates the results to the original research questions (Morgan, 1998).

The key feature of a focus group is the interaction between participants on a set of specific issues. In order to make the interaction most productive, selection of participants on the basis of some shared experience is helpful (Kitzinger, 1994). Participants can be strangers to each other or people who are already familiar through living, working or socializing together. The recruitment of participant for the focus group can be conducted from a large pool of contacts or a pre-screened list of potential participants by the researcher, volunteers or an outside group or agency. Venue for the group sessions should be easily accessible and familiar to all participants. The room needs to be quite and comfortable, free from interruptions and observations by the people who are not participating in the focus group (Kitzinger and Barbour, 1999). The moderator of the focus group has the authority to guide the participants to follow instructions regarding the topic areas being discussed and check the participation of every participant in the discussion of each set of issues (Greenbaum, 2000).

A typical focus group lasts for 90 minutes. The most common method of recording focus group discussion into analysable data depends on audio-taping and note taking. The conversion of focus group discussion into a usable report can take a considerable amount of careful and systematic analysis. Usually a final written

report emphasises the major themes that arose in the focus group discussions (Morgan, 1998). In all stages of focus group research design, implementation and presentation proper attention must be given to ethical issues. Providing a statement of informed consent to the participant tells them about the potential risks in the project and their rights as participants in the projects. In the case of confidentiality, focus group participants cannot assure an unconditional guarantee that confidences shared in the group can be respected if participants are part of the same social network or due to indirect disclosure by the participants (Kitzinger and Barbour, 1999).

4.4.2 Advantages and disadvantages of focus group

Focus groups are a way of listening to people and learning from them. As a qualitative research method, focus groups are useful for exploration and discovery, understanding context and depth and interpretation of a research problem. A lively discussion among the group members is helpful to explore and discover about either topics or groups of people that are poorly understood. The effective use of group dynamics among the participants can improve the richness of the information generated as participants try to convince those who have the opposing perspectives with more reasons for their view (Greenbaum, 2000). The participants of a focus group investigate the background behind people's thoughts and experiences. The give-and-take of the group discussion and hearing how the participants react to each other provide contexts for why a participant feels one way rather than other and an in-depth view of the range of their experiences and opinions. The encounters and discussions in a focus group give an understanding and interpretive insights the researcher is looking for (Morgan, 1998).

Focus groups can be used as a pre-pilot work to provide a contextual basis for a survey design and an interpretive aid to survey findings. As an ancillary method, focus groups offer feedbacks on findings to research participants. It could be served to qualify and elaborate other findings, clarify a puzzling finding or to contest previous work. While in a multi-method research design, focus groups

offer an opportunity to deepen the earlier analysis by the research participants. It is a vehicle for extending public participation in the research process (Bloor et al, 2001). As a research tool focus groups offer clients a flexible, fast, and cost-effective way to gain insight into a specific set of issues. Its vibrant interactive means of probing a variety of issues can disrupt researchers' assumptions and encourage research participants to explore issues, identify common problems and suggest potential solutions through sharing and comparing experiences (Kitzinger and Barbour, 1999).

Even though focus groups are an excellent research methodology, sometimes this technique produces incorrect results where a different technique would be more suitable to accomplish the research objectives. The tendency to use focus groups as a cheap alternative to quantitative research, likely to create misleading results and could ultimately damage the overall purposes of research activities. Another drawback is, the absence of a successful professional moderator in a focus group may lead to produce data that they are not intended to generate in the group discussion. Also implementing more focus groups than are necessary to achieve the research objectives does little to improve the projectability of the collected data (Greenbaum, 2000). The lack of understanding focus group as a serious research method affects the quality of the output from the research. An informal approach in conducting a focus group could result in an inadequate advance preparation in recruiting the correct participants, and moderator; the moderator may be improperly briefed and the researchers themselves do not attend the groups or they do not pay attention in observing the group and figuring out the implications. Sometimes researchers assume comments of one or two participants are the consensus view of the entire group instead of identifying the overall sense of the group relative to the topic being discussed (Greenbaum, 1998).

4.4.3 Conducting focus groups

Conducting focus groups successfully need proper attention in each of five aspects of focus groups such as planning, recruiting, moderator guidelines, analysis and reporting (Morgan, 1998).

Planning

Planning is the first step in any project. The planning stage of focus groups involves conceptualizing the study, developing the questions, and determining the logistical arrangements. Experience and talent of the researcher can make a big difference in the planning process. The amount of experiences and training helps the research team to foresee crucial issues at the beginning of the study. They develop appropriate questions that fit the study and select participants according to the characteristics in relation to the topic being discussed. Also, another important factor which needs attention in the planning of focus groups is to ensure that the cost of doing it does not exceed the budget (Morgan, 1998).

Recruiting

Focus groups members are selected on the dynamics between individuals within the group. According to particular research questions and key characteristics that are considered relevant, purposive or theoretical sampling can be used to recruit participants. A pre-existing sampling frame of participants who meet the criteria for participation and a proper procedure for contacting potential participants may be useful in the recruitment process. If a pre-existing sampling frame or pool of respondents is not available, then participants can be recruited individually at a chosen sampling site. Trained recruiters make the first contact with the potential participants and follow-up contacts to ensure that everyone attends (Bloor et al, 2001).

Moderator guidelines

One of the important elements which determines the success of a focus group is the presence of an experienced moderator. The role of the moderator includes the management of the research process, such as preparation, implementation, post group procedures and analysis. The moderators must have some key personal and professional characteristics to ensure the success of focus groups. Most important characteristics for a successful moderator are hardworking, self-motivating, self-confident, a quick learner, friendly, a good listener, an excellent memory, excellent communication skills, excellent organizational skills, the ability to remain objective at all costs, and ability to work effectively with a group process.

Analysis

Focus groups produce large amount of dynamic data. These data are distinct from other forms of qualitative data due to focus groups interactive nature, which increases complexity and richness of the data. By doing focus groups data analysis, the researcher compares and examines discussions of similar themes and draws conclusions on consensus expressed or constructed by the group. A full and thorough audio transcription helps the analyst to identify all speakers, and all speeches in the group context. Once transcribed every data are indexed under one heading concerning to a particular theme. A rigorous analysis of focus groups data can be done using systematic approaches such as analytical induction or logical analysis (Bloor et al, 2001). Analytical induction develops exploratory hypotheses applicable to all the data available on a particular issue (Frankland and Bloor, 1999) whereas logical analysis suitable for analysis of topics like revealing the interpretation of definitions, beliefs or evaluations whether individual or cultural (Williams, 1981).

Reporting

The end result of focus groups is usually a report which includes a summary of findings, conclusions and recommendations on the sets of topics discussed. It is

the formal record of the focus groups. It provides all important information related to the focus groups such as date and timings, objectives, methodology, the number of groups participated, the approach to recruiting, findings, conclusions, recommendations and an appendix which provides a record of the details of the group implementation (Greenbaum, 2000). In reporting focus group data, the researcher must be aware of the readability of any data presented. In order to render the data readable, it is at the reporting stage any editing of text and of transcription conventions take place. It is worthwhile that with focus groups, presenting long quotations can provide some of the context to the speech (Bloor et al, 2001).

Focus group within the study

According to Kitzinger (1994) selecting a pre-existing group on the basis of shared experiences, knowledge and skills for a focus group has many advantages. Pre-existing groups promote discussion and debate naturally, protect participant anonymity, reduce recruitment effort for the researcher by contacting one individual group member to obtain consent from other group members, and reduce attrition rates (Bloor et al, 2001). Thus, participants were identified from the shipping and logistics industry in the SW UK. Members of the Maritime and Waterborne Innovation Group, which aims to promote water freight in the region, have expressed their interest in joining a focus group for a group discussion on the results of the Delphi study on the potential for water freight in the SW UK. Members who expressed their consent in participating in a focus group discussion were contacted using their emails and phone numbers. The email sent was an invitation to become a participant of the focus group and explained the location selected for the focus group, time, a short description of the research, and points to be discussed.

Analysis of the focus group data was based on a model, ‘continuum of analysis’ suggested by Krueger (1998). A continuum of analysis starts with the collection of raw data, descriptive statements about that data, interpretations of the data and

ends with recommendations. Collection of data was completed by conducting focus group discussion effectively, audio recording of the discussion, transcribed observational notes and typing up of the recorded information. Making descriptive statements about the data was achieved by listening to tapes, transcribing the focus group, repeated reading and close examination of transcripts and observational notes taken during the focus group discussion. These descriptive statements were indexed and analysed using a computer based approach for sorting, arranging and rearranging data through comparing and contrasting the relevant information. Interpretations of the coded data were carried out using seven established criteria provided by Krueger (1994). Seven criteria included words, context, internal consistency, frequency and extensiveness of comments, specificity of comments, intensity of comments and big ideas (Krueger, 1994).

4.5 Ethical consideration

Ethical permission for the study was obtained from the Faculty of Business, Academic Partnerships, Faculty Research Ethics Committee, University of Plymouth. The following issues were addressed in the application for ethical clearance and the research was conducted according to these guidelines.

Informed Consent: Each participant was informed about the features of the research in order to encourage them to express their willingness to take part in the study using an email cover letter. An explanation was given to potential respondents about the purpose of the study, and how the data that they contributed to the study would be handled. The Focus Group participants were informed that the discussion would be audio-taped.

Openness and Honesty: Each participant was conversed about the purpose of the research and its practical implications to the shipping, logistics and supply chain industry before starting the Delphi study and Focus Group through email communication.

Right to Withdraw: Every participant was guaranteed the right to withdraw from the study at any time if they wished to do so.

Protection from Harm: The researcher has taken all care to protect participant from any kind of harm at all times during the investigation by communicating them about the purpose and nature of the study and giving them clear understanding of the procedures to follow. The participants of the Focus Group were mature experts and they know each other in the shipping and logistics industry. So, the impact of disclosure in a group setting did not lead for any difficult situations since any sensitive issues were discussed in the focus group.

Debriefing: The researcher provided a clear idea about the purpose of the research and its procedures before the beginning of the Delphi study and Focus Group by sending a cover letter with detailed information about these data collection methods, to each participant.

Confidentiality: It was clearly mentioned in respondent's email that the details of all participants' identities and their contributions to the study were confidential throughout the conduct and reporting of the study and they remain anonymous to each other. In the case of Focus Group, the researcher cannot ensure complete confidentiality because it would not be controlled what participants of the Focus Group may reveal after the completion of the meeting. The researcher requested participants not to share other group members' opinion to outsiders but could not promise their complete cooperation in this. Participants were informed about how the data collected would be used for the study and confidentiality regarding the identity of individuals will be maintained.

The next chapter discusses the development of the three Delphi surveys on the potential for water freight in the SW UK and Delphi Rounds 1, 2, and 3.

Chapter 5. The Delphi Process

The aim of the current chapter is to discuss the process of the Delphi through Round 1, 2 and 3 and to analyse the results of data collected in each round of the Delphi study.

5.1 Problem definition

The research problem focuses on the potential for water freight in CAD. These two counties have an extensive coast which can support easy access to many ports in the region. An investigation of present water freight movements in these regions was conducted to identify the nature of water transport in the region. As a sustainable mode of transport, the government is planning for a widespread use of water transportation in the UK. The literature review revealed that the amount of water freight transportation is low or limited in CAD compared to other parts of the country (DFT, 2013). In this situation seeking experts' opinion in developing waterborne freight in the SW UK should assist the shipping and logistics industry in the region to increase the usage of water transportation maximum possible. Therefore, an answer to the research question such as potential for water freight in the South West contributes positively by offering all the advantages of it to the industry and society.

5.2 Panel selection

According to Jackie et al (1997), the expert panel is the most essential component of a Delphi study, since the success of Delphi undoubtedly depends upon the participants' expertise. Accordingly, objectives of this research determine the size of the Delphi and the potential experts for it. To analyse the potential for water freight in the SW UK, the current Delphi focuses on the water freight transport sector, and firms, businesses and organisations related to water freight in the SW UK. The Delphi method requires subject matter experts as its panel of

respondents. The ideal source of potential experts to take part in the study is from the industry and organisations involved and representing the water freight transport sector. The selection criteria included knowledge on the topic, and the personal experiences or being stakeholders. As per the opinions from specialists in the Delphi method, a heterogeneous expert panel produces high quality, highly acceptable solutions compared with homogeneous groups (Delbecq et al, 1975). In the opinion of Martino, (1972) the number of experts in one sample size for a heterogeneous population can use 15-30 subject-matter experts. Gibson and Millor (1990) suggested an initial list of 60 participants to produce 20-30 actual participants.

This study decided to elect a heterogeneous expert panel to achieve better performance and a wider range of alternatives on the topic of discussion. The preferred numbers of experts was 15-30. A heterogeneous expert panel for the Delphi study required contact details of different organisations, firms, and business related to water freight. With the help of internet research, recommendation from officials in different firms and consultation with industry organisations 100 potential respondents were identified and sent an e-mail request to become an expert panel member for the Delphi study. This includes experts from all ports in the SW UK and major ports in UK including London, logistics, supply chain and shipping experts in academia, CILT UK, Women in Logistics, The Multimodal Group, UK Chamber of Shipping, Politicians, CAD counties, councils in CAD, inland water associations, ship brokers in CAD and maritime journalists. The e-mail sent as the invitation to become an expert panel member explained about the Delphi study, its features, the role of respondents, how long the survey would take and how information would be used. It gives an assurance to the respondents that they remain anonymous and their answers confidential, used only for research purposes and not shared with any third parties.

Among the 100 e-mail requests sent, ten of them were undelivered and an extra set of e-mail requests were sent to experts in the water freight industry. A total of 29 potential respondents agreed to become a member in the expert panel. The

expert panel is then divided in to different categories. The expert panel included subject experts from the industry (logistics, supply chain management, shipping), researchers, academics, and politicians. Academics were selected from renowned universities specialised in transport, logistics and maritime all over the United Kingdom and industry experts, researchers and politicians were selected from SW UK.

Table 5.1 Classification of Expert Panel

Respondents	Number
Industry experts (Logistics, Supply Chain and Shipping)	13
Academics	12
Researchers	2
Politicians	2
Total	29

The first round of the Delphi survey on the potential for water freight in the SW UK was sent to 29 agreed expert panel members through e-mail. The e-mail included words of gratitude for their consent to become a member of the expert panel and time they are going to spent on the survey. A brief explanation of the Delphi study and the importance of the research undertaken were also explained. To get the access to the Delphi survey a link was provided in the e-mail. They were given two weeks' time to complete and send the survey back. The panel members were also given clear and precise instructions of how to administer the questionnaire. In case of any problems or concerns that might require clarification about the survey, the Delphi facilitator contact details were also given.

Table 5.2 Taxonomy of the potential for water freight in the SW UK Delphi study

Criteria	Choice for this Delphi study
Purpose of the study	Exploration
Number of rounds	3
Participants	Heterogeneous Group
Mode of operation	Remote
Anonymity of panel	Full
Communication media	Computerised
Concurrency of rounds	Sequential set of rounds

Source: Day and Bobeva, 2005

5.3 Development of the Delphi Round 1 Questionnaire

The aim of developing the Delphi study first round questionnaire was to find the potential for water freight in the SW UK especially in CAD. As a social research technique, the Delphi method organises communication between a group of experts to obtain the most reliable consensus of opinion when there is uncertainty or lack of empirical evidence in the given topic (Murphy et al, 1998). The different issues highlighted in the Delphi first round questionnaire were aimed to bring a clear picture of CAD current status of water freight and shed light on the issues to be discussed and resolved in subsequent rounds of the Delphi study. Questions are framed for the discussion based on the objectives of the research, from the literature review conducted on different aspects of water freight and research conducted on the Delphi method. Each question represented one of the objectives of the research and had the potential to contribute to the discussion among the expert panel. After the construction of the questionnaire a pre-testing was conducted with one of the eminent academician and logisticians in the SW UK to identify any bias or potential misunderstandings which might have occurred during the formulation of the questionnaire. Thus, the initial pre-test identified the

potential benefit of stating the definition of the subject matter in order to ensure that all panel members had a basic understanding of it.

A questionnaire is a prepared set of questions used by respondents or interviewers to record answers to generate primary data (Hair et al., 2007). This Delphi study included a structured questionnaire. It started with classification questions which led to research topic questions.

Table 5.3 Questionnaire Design

Type of Questions	Description	Questions Number
Classification questions	Personal information	1
Research topic questions	Research Objective - one	2,3,4
Research topic questions	Research Objective - two	5,6,7
Research topic questions	Research Objective - three	8,9,10,11,12,13,14
Research topic questions	Research Objective - four	15,16,17,18
Research topic questions	Research Objective - five	19

Source: (Sekaran, 2000)

5.3.1 Breakdown of Delphi Round 1 Questionnaire

The Delphi Round one questionnaire consisted of 19 questions with one classification question and 18 research topic questions. Every research topic question has three options available for respondents to select and each answer required an explanation also. Each question and its relevance are explained below.

Question 1

The first question in the survey is a classification question which is intended to collect personal information of the respondents. It asks respondents' names, their working place, current position, their area of expertise and the country where they

are working. This question is important to ascertain who attended the survey in the allocated period of time and to encourage them to finish the survey in the given time.

Question 2

Do you believe the geography of the SW UK is suitable for extensive water freight movements in the region?

This question asks the expert panel members whether they agree on the potential of SW UK water freight. After achieving a consensus on this critical point, it makes sense to move forward to collect more information about the nature of water freight in the SW UK.

Question 3

Do you think water freight in the SW UK can support transfer of road freight movements to water?

The purpose of the question is to collect information and consensus about the capability of water freight in the SW UK at present and in future to support the transfer of road freight to water.

Question 4

Do you agree that logistics professionals and freight forwarders are fully aware of the potential of water freight in CAD?

It is important that logistics professionals and freight forwarders are fully aware of the potential of water freight in the SW UK to utilize the maximum capacity of it now and to encourage its future developments. So, it is essential to ask the panel members whether they agree on the awareness of logistics professionals and freight forwarders about the potential of water freight in SW UK.

Question 5

Do you believe by using water freight, the cost of transportation can be reduced significantly compared to road transport?

The literature review conducted on water freight revealed that using it as one of the transport modes reduces the cost of transportation considerably. Asking the expert members about the cost reduction feature of water freight, and if there is consensus, this supports the theory.

Question 6

Do you believe an increase in water transportation will reduce the negative impacts on the environment and external costs caused by road transportation and increase sustainability?

The logistics industry benefits from the increased usage of water freight in many ways as explained in the above question. A consensus from the expert panel would confirm the importance of water freight and become a reason to increase the use of water freight in the region.

Question 7

Do you think integrating water freight in to intermodal transportation will result in just in time and door to door delivery of goods?

From the literature review it was understood the freight industry has a wrong perception about the ability of water freight in door to door delivery and just in time delivery of goods because of its inherited features. This question tries to reach a consensus on the qualities of water freight while integrating in to intermodal transportation.

Question 8

Do you believe the potential of water freight as a mode of transport is fully utilized in CAD?

The literature review on water freight in CAD revealed that many factors hinders the use of water freight in its full potential. This question helps to collect more information about the hindrances to the proper use of water freight in CAD.

Question 9

Do you think water freight in CAD is facing problems to utilize its full potential?

Question nine supports question eight by asking about different problems faced by water freight in CAD to reach its full potential of capacity. The expert panel opinions bring more evidence on this matter and it helps the industry to focus in the right path to move forward.

Question 10

Do you believe complete integration of water freight in the logistics chain is difficult?

This question aims to collect expert panel opinion on the importance of water freight in a logistics chain in the supply chain. A consensus on this matter determines the place of water freight in logistics industry is important or not.

Question 11

Do you think water freight in CAD would perform better if it had sufficient trained crew and opportunities for continuous training on technological advancement?

In general, it is proved that lack of trained crew and opportunities for continuous training affect the performance of water freight everywhere in the world. The expert panel opinions determine how these facts are affecting the performance of water freight in CAD.

Question 12

Do you think there is a lack of sufficient infrastructure and facilities at the ports in CAD to handle more commercial activities?

In CAD, the majority of the ports are small. A consensus from the expert panel decides how the infrastructure and facilities in these ports are influencing the day to day functioning of the ports.

Question 13

Do you think the complex administrative process of water transportation is having a negative effect on the development of water freight in CAD?

The answers to this question determine how the complex administrative process affects water freight in CAD or whether due to this reason water freight in this region is not progressing properly.

Question 14

Do you believe the growth of water freight in CAD is negatively affected by insufficient government incentives and inadequate promotion by the Department of Transport?

The answer to this question brings out the importance of government incentives and promotion by the UK Department of Transport for the development of water freight in the country. Expert panel opinion finds out how these factors affected the growth of water freight in CAD.

Question 15

Do you think water freight is a sustainable green alternative to road and rail?

Many studies have suggested the role of water freight is important in maintaining the sustainability of a region. In this situation the expert panel opinion on the

different characteristics of water freight determines whether it is sustainable a green alternative or not.

Question 16

Do you think firms and society in CAD would benefit more from the usage of water freight in terms of competitive cost, integration across all regions, economic progress, overland congestion, added security, and agility in customer delivery compared to road transport?

This question aims to compare the socio-economic importance of water freight and road transport. A discussion on the qualities of each mode of transport determines which is more important to a society and firms.

Question 17

Do you think water freight is more labour, energy, and fuel efficient than road transport?

This question supports question 16. The socio-economic importance of water freight or road transport is determined by comparing its efficiency in labour, energy and fuel.

Question 18

Do you believe that water freight is potentially a more important source of revenue and employment which can lead to the economic growth and prosperity of CAD compared to road transport?

After a discussion on questions 16 and 17, it is easy to find out which mode of transport is potentially more important source of revenue and employment in terms of economic growth and prosperity for CAD.

Question 19

Please give your suggestions for developing water freight as an efficient and sustainable mode of transport in CAD

5.4 Delphi Round 1 Results

The first round of the Delphi survey was sent to 29 pre-agreed expert panel members. A total of 25 of them were returned, in that one of them did not answer any of the questions other than the classification questions. Thus, there were a total of 24 surveys useful for analysis for the Round two Delphi study. The respondents were given two weeks to complete the survey and sent back to the Delphi facilitator. After the first week, the first reminder was sent to those who were not responding to the survey, requesting their participation and explaining the importance of their responses to the study. Before ending the time limit one more reminder was sent to remind them the survey was available until the fixed date. The survey was closed after two weeks of time and a total of 25 expert panel members participated in the study where 24 of them were useful for further analysis.

Delphi Round 1 survey responses are presented in appendix B

5.4.1 Consensus achieved in Delphi Round 1

The first round of the Delphi study contained a total of 18 statements to achieve consensus among the respondents on the potential of water freight in the SW UK. After completing the first round of Delphi study a total of four consensuses were achieved.

5.4.1.1 Consensus Analysis 1

The first statement that achieved consensus in the first round of the Delphi was ‘Do you believe an increase in water transportation will reduce the negative impacts on the environment and external costs caused by road transportation and

increase sustainability? The statement was formed to explain the importance of water transportation in today's polluted transport industry. Many studies are there to support the positive aspects of water transport in increasing the sustainability and reducing costs of accidents, emissions, noise, operation and maintenance of public infrastructure. According to Sauri and Turro, (2013) water transport could be a more sustainable and environmental-friendly mode than road haulage as it consumes less fossil fuel per tonne-km, produces less noxious emissions and less CO2. A move from road transport to water freight has the potential to save three quarters of the carbon involved in the transport of the same tonnage by road (Inland Waterways Advisory Council, 2007). The professionals in the expert panel have commented on the above statement very positively. In a total of 24 expert panel members 19 of them agreed with the statement, two of them disagreed and three of them were unable to comment on the statement. The explanation of the expert panel about the positive features of water freight on the environment and human being's life is shown in appendix B

Though all comments appreciated the environmental benefits of water freight, some of them suggested different options to improve the use of water freight, rail and road. To increase the use of water freight one of the comments pointed towards the requirement for economic incentives. There were many comments to support the view that the emission of carbon from water freight is low and by using cleaner fuel this could further reduce the negative impacts on the environment. Another comment recommended that in order to increase the use of water freight, improved logistics infrastructures at the departure and arrival points is needed. One of the observations supported the view that ships are more environmentally friendly than lorries in that ships carry more cargo per journey and external costs are less. At the same time another observation from the expert panel refers to the sulphur content of marine fuel. The ability to carry greater volumes of cargo results in fewer vessel movements, thus offsetting the emissions issue.

One of the comments supports the view that efficient use of road may be less polluting than small ships. One of them supports the use of rail since in any circumstances road is a part of the journey.

As the Delphi is formed on the strong base of an expert panel, they have a very strong opinion on each issue. Thus, the statement which achieved consensus in the first round of the Delphi reflects the vast knowledge of the expert panel on the issue. Thus 79.17% of the expert panel members agreed that water freight is good for the environment. From the comments of the expert panel, it is assumed that the use of water freight is getting prominent in the transport industry because it has an ability to reduce impacts of pollution on the environment. The external costs such as cost of noise, accidents, congestion, damage and maintenance of infrastructure can be reduced if the use of water freight increases. The main issues to promote using water freight arose from the comments of expert panel members and are the need for economic incentives to promote water freight, demand for more infrastructure, high transhipment cost, high price of cleaner fuel, and emissions from small ships.

The consensus reached on the environmental benefits of water freight is a strong base for the demand of better use of water freight in the SW UK. As is clear from the expert panel opinions in the beginning it requires large capital investment for an efficient and effective use of water freight but in the long run it guarantees a wise investment for society. A well planned intermodal transportation with water freight as one of the components in a supply chain helps to increase the environmental benefits and reduce negative impacts of pollution on the society. The use of water freight to become more reliable and to increase the frequency of service depends upon the development of infrastructure at the ports. As one of the expert panel members suggested, the public and legislation must highlight the qualities of water freight in order to overcome all the difficulties to become a reliable service provider in the future.

5.4.1.2 Consensus Analysis 2

The second statement that achieved consensus in the first round of the Delphi survey was ‘Do you believe complete integration of water freight in the logistics chain is difficult?’ 79.17% of the expert panel had agreed on the above mentioned statement whereas 12.50% of them disagreed and the remaining 8.33% of the expert panel could not comment on the statement. The statement was asked to establish the importance of water freight in a logistics chain. A logistics chain is an important part of the supply chain. The role of the logistics chain in a supply chain is to supply goods, services and related information from the point of origin to the end user. Every supply chain expects a reliable, speedy and frequent service from a logistics chain. In such conditions, the mode of transport used in a logistics chain primarily focuses on meeting the customer demand without any failure. Thus, asking the opinions of the expert panel on the integration of water freight in a logistics chain reveal their attitudes on water freight in a logistics chain and how well this mode of transport could function in a logistics chain to meet customer demand efficiently and effectively. Through the integration of water freight in a logistics chain, it is possible to determine whether the integration is beneficial, what are the advantages of the logistics chain, any drawbacks that affect the logistics chain or what should be given importance before placing water freight in a logistics chain as a mode of transport. From the expert panel’s opinions, a consensus was formed by explaining that the integration of water freight in a logistics chain is difficult. The majority of the expert panel has given their explanation on this matter.

Explanations of the expert panel members for statement 10 in the first Round of the Delphi survey is presented in appendix B

From the explanations of the expert panel members it is understood that the integration of water freight in a logistics chain will have to face many complications to become successful in its operations. According to the opinions of the expert panel by overcoming these different types of issues, water freight could turn out

to be an active part in a logistics chain. A detailed analysis of the expert panels' suggestions gives more insight into the present and future problems in the integration of water freight in a logistics chain and remedies available to overcome these issues.

The main problem discovered for water freight to become a part of an intermodal logistics chain from the suggestions of the expert panel is the lack of infrastructure at the ports, road links, investments, qualified specialists and inflexible physical infrastructure. The construction of multimodal infrastructure is costly, and to assist companies in moving towards a more water freight based logistics chain there is a lack of specialists in the industry. Before capital investment in infrastructure the expert panel warns about the need to satisfy some pre-qualifications such as good freight volumes, large population areas and berths close to minimise transhipment. A few reasons listed by the expert panel are, the South West Coast lacks inland waterways to use water freight to its full potential, using water freight in a logistics chain involves more modal change, double handling, disruption by weather and there is a demand for rail transport links to be upgraded and improved to reduce journey times. Another reason put forward by the expert panel is that water freight lacks the main qualities of intermodal transport such as reliability, speed and frequency of services and to involve it as a part of a logistics chain requires considerable planning to achieve its goal within the limited time and costs.

Even though there are many reasons to explain the difficulty of integration of water freight in a logistics chain, the biggest issue is the unchanging mentality of potential users to recognise the water freight potential. A change in the mind-sets to make it happen and a shift in culture and practises can definitely improve the present scenario of leaving the potential of water freight untapped. From the expert panel opinion, there should be a strong leadership to change old customs and belief with regard to the integration of water freight in the logistics chain. The ignorance of the strengths of water freight and resistance to accept its potential are the two reasons behind the unchanging mentality towards water freight.

Presenting such a statement regarding the integration of water freight in a logistics chain has revealed many underlying problems. The suggestions from the expert panel members help to stimulate thinking more about each issue while integrating water freight in a logistics chain. In order to use water freight in a logistics chain the recommendations from the expert panel help to prioritise each issue and to create solutions to address each issue. The discussion on this matter helps to identify that one major problem faced in the integration of water freight in a logistics chain is none other than the attitude, unchanging mentality, resistance to accept changes and unwillingness to make it happen. Other issues such as lack of infrastructure, investment, qualified personnel and demand for freight everything will follow if there is a change of mind to establish water freight as one of the important components in the logistics chain. The majority of the expert panel members have no doubts of the potential of water freight as a mode of transport and encouraged the implementation of water freight as a part of the logistics chain to improve the efficiency of the chain.

The objective behind this statement is to understand why many logistics firms are not using water freight as a mode of transport in their daily operations and what are the reasons blocking them in using water freight. The consensus formed by the expert panel members has given a very detailed reason for that. By following the expert panel members' suggestions to resolve each issue, water freight could develop as one of the most reliable, frequent and speedy transportation modes in a future logistics chain.

5.4.1.3 Consensus Analysis 3

The third consensus formed by the expert panel members on the potential of water freight in the SW UK is 'Do you think water freight is a sustainable green alternative to road and rail? The statement was agreed by 87.50% of the expert panel members, 4.17% disagreed and 8.33% of them were unable to give any comment. Many studies proved that it is much better than road and rail transport. Water transport is considered as one of the most sustainable and economically

competitive modes of transport compared to road (Medda and Trujilo, 2010). Water freight offers a sustainable green alternative to road and rail, generating less CO2 per tonne-kilometre(Carr, 2011). Water freight helps to realize remarkable savings in fuel consumption, lessen air pollution from fuel combustion, smaller traffic congestion, fewer accidents on railways and highways, and less noise and distruption in cities and towns (US Army Corps of Engineers, 2014). The entire research is developed on the foundation of sustainability characteristics of water freight. Achieving a consensus on the statement helped to identify the need for water freight and utilise its potential to provide a better quality of life for society. From the literature review it was evident that the use of water freight in the SW UK is limited due to many reasons. The consensus on the sustainability factor is a solid reason to consider the increased use of water freight in the future. The explanations of the expert panel on water freight as a sustainable green alternative to road and rail are shown in appendix B

The explanations of the expert panel members, on the statement of water freight as a sustainable green alternative to road and rail revealed that water freight has an advantage of economies of scale because of the capability to carry more goods in terms of fuel per tonne. The majority of the expert panel members are aware of the fuel efficiency of water freight compared to other modes of transport. The two qualities of water freight such as ability to carry more cargo and fuel efficiency made it a particularly sustainable mode of transport. These qualities of water freight help us to reduce the dependency on road and rail transport. In the opinion of one of the expert panel member, maintenance of rail infrastructure is expensive because long term use increases depreciation of the rail tracks and locomotives and need to be changed after a certain amount of mileage. Another expert panel member mentioned that very small ships are more polluting than road and much more than rail. One of the expert panel members supported this by stating that rail is better than road and shipping.

The consensus formed by the expert panel members on the sustainability characteristics of water freight is a very strong supporting factor to demand for a

planned use of water freight in the SW UK. This consensus is a solution to make practical decisions to shift possible long distance road freight in to water freight in order to minimise pollution from road movements. The shift of road freight to water produces not only less pollution but also less noise, congestion, accidents and better quality life to society. Creating awareness about the benefits of water freight among freight forwarders, logisticians and exporters is very important. They are the decision makers of freight movements. From the EU we get many studies and practical examples to support the consensus formed by the expert panel. This study also aims to the better utilisation of available water resources in the SW UK. Since water freight is a sustainable green alternative to road and rail is an inspiring fact to many logistics and shipping companies to start making a difference in their view point.

5.4.1.4 Consensus Analysis 4

The last consensus formed in the first round of the Delphi survey was on the statement ‘Do you think water freight is more labour, energy, and fuel efficient than road transport? 78.26% of the expert panel members were agreed on it, 13.04% disagreed and 8.70% were unable to comment. This statement is also supported by much research and many studies conducted in the shipping and logistics industry. Waterways consume the least amount of energy per ton-km when compared with the other modes of transport, and the ton–km cost for water transportation is very low. For example: a truck consumes 4.06MJ/ton-km energy for moving 7.3 ton cargo, rail uses 0.59MJ/ton-km energy for moving 1000 ton cargo and inland navigation consumes only 0.43MJ/ton-km energy for moving 1250 ton cargo load (Dutch Inland Shipping Information Agency, 2004). Barges consume 50 times less fuel than the road fuel required by a single lorry (Glaves, et al, 2007). According to the Texas Transportation Institute, fuel efficiency of inland river towing as an alternative means of transportation is 3.7 times more than trucking and 1.4 times more than rail (Jacob, 2009). In the opinion of Garratt (2004) water freight is cost, energy and labour efficient, crucial given potentially growing shortages of HGV drivers and energy costs, and it can contribute

substantially to Government's policy of sustainable distribution. The clarifications of the expert panel memebrs on their answers on water freight focus more on labour, energy and fuel efficiency than road transport are given in appendix B

The aim of reaching consensus on this statement was to understand the socio-economic importance of water freight in soceity. The consensus revealed that water freight is more labour, energy and fuel efficient than road transport and needs less of energy, fuel and labour to operate. Using less enegy, fuel and labour produce less side effects to soceity. Emissions like CO2 and other dangerous gases are produced less by using less fuel. High energy efficency helps the water freight to move freight greater distances with less amount of energy which in turn saves money. By using less labour with modern technology it also saves time and money and this also helps in determining the final product price reasonably. The consensus is again proved that water freight is a need for a soceity rather than a luxury. The benefits of using water freight make few negative impacts on soceity. As a future mode of transport the logistics and shipping industry must start to use more water freight whenever there is a demand for it. A conscious effort to use water freight is neccessary to promote it in the world of road freight movements. By realizing the positive sides of water freight logisticians, freight forwarders can discuss it with concerned parties to involve water freight in the supply chain wherever it brings benefits to the entire supply chain.

The analysis of the explanations of the expert panel members of their view-point on the statement 'Do you think water freight is more labour, energy, fuel efficient than road transport?' revealed that almost everyone in the expert panel agreed that water freight is more fuel and energy efficient than road transport. More freight can be transported on a single large ship than by a large number of lorries. A few members in the expert panel explained that all water transport needs road connections and other modes for collection and delivery. Some of them had a view that water freight is more labour intensive, vessels are needed with qualified crews and they demand far higher wages than lorry drivers. At the same time one

of the expert panel member said modern ships can sail with only a small number of crew on board.

The consensus on the efficiency of water freight is an important agreement that admits by using water freight the cost of transportation, external cost and amount of pollution are reduced. There are many other advantages also for using water freight such as safety, lowest environmental costs, time reliability, reduced infrastructure costs, high carrying capacity, high potential for intermodal networking, large number of available capacity, suitability for transporting abnormal loads, and possibilities for tailor-made transportation. This consensus helps planners to think more about the contributions of water freight as a mode of transport. As explained in the literature review, prominent supermarkets in the UK like Sainsbury's, Tesco and Marks and Spencer started to use water freight to transport their goods albeit in limited amounts. More supermarkets and other players in the industry would realize the benefits of using water freight and encourage them to transport goods using water freight is one way to increase the use of water freight in the SW UK.

5.4.2 Delphi Round 1 Analysis of statements that did not reach consensus

In the first round of the Delphi survey 58.33% of the expert panel members agreed to question 2

Question 2 Do you believe the geography of the SW UK is suitable for extensive water freight movements in the region?

Respondents were given an opportunity to clarify their views on their answers. Thus, their comments brought a wider perception to the question. Even though a majority of the expert panel members approved question 2, they gave their own explanation to their answer choice. From their comments, it is clear that the SW UK has an extensive coastline which is suitable for water freight. They suggested that the term 'extensive' used in question 2 is not suitable to express the amount

of water freight in the SW UK, because there are many restrictions blocking the maximum use of water freight in the South West region. They include limitations in the infrastructure, poor inland links, lack of funding, insufficient local population at ports or industry, lack of deep water and high tidal range/low draft. At the same time expert panel members reported that, due to poor road and rail infrastructure, presence of extensive coastline and easy access to numerous harbours in the SW UK, use of water freight in the region is worthwhile. Based on the majority of opinions from the expert panel the Delphi facilitator reframed question 2 as shown below

Q2 Do you believe the presence of extensive coastline, access to a range of ports and poor road/rail networks in the SW UK are supportive for water freight movements in the region?

The statement presented next received equal “agree” and “disagree” responses from the expert panel members (45.83%) and 8.33% of them were unable to comment. The statement was

Q3 Do you think water freight in the SW UK can support transfer of road freight movements to water?

From the explanations of the expert panel members, their concerns, hopes, ideas, doubts and suggestions on the transfer of road freight movements to water were disclosed. In their opinion water freight SW UK has the potential to support road freight to be converted into water freight but there needs to be sufficient port infrastructure, and road and rail links to ports. Many ports in the region are not large enough to support the transfer of road freight to water. Cheap road pricing, double handling requirement, high fixed costs of modal transfer, poor road network, and possible delays are the main problems that need to be resolved for supporting the transfer of road freight to water. They hope that by transferring freight to water congestion on the roads can be reduced. Some of the comments pointed out the small sizes of the ports and they encourage small quantities of single bulk cargo movements. The major comments produced by the expert panel

members were the lack of sufficient infrastructure at the ports, road and rail links, less private roads, and high costs for handling cargoes. Based on these comments the Delphi facilitator has changed the statement into a new one to achieve consensus among the expert panel members. The new statement is given below

Q3 Do you think with the help of improved resources; water freight in the SW UK can support transfer of road freight movements to water?

A statement on the capacity utilization of water freight in CAD was the next subject of discussion given to the expert panel members but which did not reach consensus. The statement was

Q4 Do you believe the potential of water freight as a mode of transport is fully utilized in CAD?

75% of the expert panel members disagreed with the statement. Only 8.33% of them said the capacity of water freight is fully utilized in CAD and 16.67% of them were unable comment on the statement. According to the expert panel members the potential of water freight is utilized only in the dry and wet bulk sectors. There many wharves unused in many locations. Over-regulation of marine traffic, lack of public funded marine freight infrastructure, poor road and rail connections and absence of small scale unitisation system prevent expansion of water freight. Many ports in the South West cannot accommodate large shipments of cargo because of draught requirements. The demand is currently filled by road transport. To reach a positive consensus a new statement was formed.

Q4 Do you believe the potential of water freight as a mode of transport is under-utilized in CAD?

The next statement was about the awareness among the logistics professionals and freight forwarders of the potential of water freight in CAD. The statement was

Q5 Do you agree that logistics professionals and freight forwarders are fully aware of the potential of water freight in CAD?

Only 16.67% of the expert panel members agreed that the logistics professionals and freight forwarders are fully aware of the potential of water freight in CAD. 54.17% of them disagreed with the statement and 29.17% were unable to express their views. Only two expert panel members have given their explanation on the statement that the logisticians and freight forwarders are aware of the potential for water freight in CAD. In other opinions, to know more about the potential of water freight in CAD needs more research, consideration and information sharing among the professionals. There are many issues stopping the logisticians and freight forwarders in knowing more about the potential of water freight. They are, people who are responsible for conducting water freight but not ready to find out the new uses and possibilities for its better use, within the current commercial and legislative framework it is difficult to consider shifting road freight to water; the economies of water transport are negated by costs of transhipment and regulatory burden on sea shipping; short sea shipping/feeder services are more expensive and can be weather dependent; too much investment would be needed; logisticians use flexible road freight to apply Just In Time methods; and the recent trend to turn port facilities into marinas restricts the available options. Knowing each issue and its possible solutions will help professionals to use water freight to its full potential. So, to achieve consensus among the expert panel members the Delphi facilitator has modified the given statement into a new one which is given below

Q5 Do you agree that logistics professionals and freight forwarders need more information about the potential of water freight in CAD?

The statement on cost of transportation by using water freight compared to road freight was the next discussion topic given to the expert panel. The original statement is given below

Q6 Do you believe by using water freight, the cost of transportation can be reduced significantly compared to road transport?

This statement was agreed by 62.50% of the expert panel members, 20.83% of them showed disagreement and 16.67% of them had no opinion. According to the expert panel opinion water freight could be cheaper only for transporting heavy bulk products for longer distance. At the same time the cost for terminal transfer, cost of time, local road costs and cost of delays would reduce the transportation cost advantages. The advantages of transportation by ship include reduced travel time and distance, because a ship can discharge goods much closer to their final location cutting out a large amount of the travel time and distance which would reduce the overall transport costs. The investments in the infrastructure may not produce any immediate cost reduction but in the long run cost savings is possible. Usually vessels carry more goods than road transport and there is no congestion at sea so transport delays might be avoided. The time taken to transport goods is longer compared to road and rail and transhipment is expensive and takes time. A general view on this matter was formed among the expert panel members. The cost of transportation can be reduced, and this depends upon the volume of commodity and the travel distance. Based on this assumption the Delphi facilitator has formed a new statement to achieve a better consensus among the expert panel members, which is given below

Q6 Do you believe by using water freight, the cost of transportation can be reduced significantly for transporting bulk products long distance compared to road transport?

The next statement to conduct a discussion among the expert panel members for achieving a consensus was

Q7 Do you think integrating water freight into intermodal transportation will result in just in time and door to door delivery of goods?'

This statement was agreed only by 41.67% of the expert panel members. 50% of them said the integration of water freight into intermodal transportation will not result in just in time and door to door delivery of goods. 8.33% of them did not have any opinion. A group of the expert panel members reported that since SW UK is largely accessible by waterways so just in time and door to door delivery of goods would be possible. With proper planning and management just in time and door to door delivery of less value cargoes where time is not crucial would be possible. The conditions to follow while going for door to door and just in time delivery of goods using water freight are a) the overall multimodal costs have to be lower than road costs, b) the frequency of services and reliability have to be competitive compared to other modes of transport. Another group in the expert panel members were saying that water freight is slow and unreliable in terms of delivery times due to weather conditions. There will be more delays than road transport. To provide good intermodal transport links via ports, road and rail links need to improve. All these views contributed to a new statement as shown below

Q7 Do you think integrating water freight into intermodal transportation will help, just in time and door to door delivery of time non-sensitive goods?

The next topic of discussion given to the expert panel was

Q8 'Do you think water freight in CAD is facing problems to utilize its full potential?'

The statement was agreed by 70.83% of the expert panel members. 12.50% of them expressed their disagreement and 16.67% of them had no opinion on that statement. The expert panel members presented many problems that ports in CAD face in utilizing their full potential. Water freight in the region lacks investment. There are very few port locations are able to facilitate ship to shore transfer from container feeder ships. The water freight in CAD needs more marketing and public support. The attitude of users of water freight and lack of original thinking to

handle small cargoes by water are other problems in the industry. To improve the use of water freight in CAD needs great infrastructure improvement, planning support, subsidy for the waterways and ports are appropriate to use and there needs to be reasonable knowledge about water freight. To reach a better consensus, all the difficulties of using water freight were incorporated in to the new statement. The new statement is

Q8 Do you think water freight in CAD has to overcome many difficulties to operate to its full potential?

The next issue discussed among the expert panel members was

Q9 ‘Do you think water freight in CAD would perform better if it had sufficient trained crew and opportunities for continuous training on technological advancement?’

This statement received 62.50% of disagreement from the expert panel members, only 12.50% of them positively replied and 25% of the expert panel members had no opinion on the statement. In the majority of the expert panel opinions trained crew and opportunities for continuous training on technological advancement is not an important factor compared to the need for infrastructure developments at the ports. Knowledge of freight by water is important. Crew training is not an issue. The need for trained crew is established through the IMO and so the training opportunities would be relatively easy to implement. The problem of infrastructure at the ports of CAD causes underutilization of water freight. The expert panel members were not ready to believe the absence of trained crew is a limiting factor in the development of water freight. In their opinion training for logisticians and planners are relevant for the betterment of water freight. More importance must be given to serious issues such as infrastructural developments and attitude changes towards water freight. Based on the opinions of the expert panel members a new statement was formed

Q9 Do you think water freight in CAD would perform better if it has sufficient trained logisticians and freight forwarders in water freight?

Another topic of discussion among the expert panel members was about

Q 10 ‘Do you think there is a lack of sufficient infrastructure and facilities at the ports in CAD to handle more commercial activities?’ The discussion resulted in 50% of the expert panel members agreeing with the statement, 29.17% of them disagreed and 20.83% of them did not have any opinion.

According to the opinions of the expert panel members, ports in CAD need infrastructure upgrade and investments in port facilities. There is no dedicated LO-LO container terminal and ports have not been designed for inward transportation. The rail and road infrastructure to support ports is also lacking thus hinterland connections are poor. As the South West is very much a tourist destination ports and harbours are relying on the leisure market for survival. The facilities at the ports would need to be brought up to legal commercial standards for handling large vessels. The successive governments’ failure over many years to invest in port infrastructure has made the situation worse. A few of them suggested that the ports have sufficient infrastructure, the main issue of using water freight is the lack of demand due to the low and spread out population. In their opinion current facilities are more than enough to meet current demand. From the view-points of the expert panel members a new statement is formed for making a better consensus among the expert panel. The statement is given below

Q10 Do you think there is a lack of sufficient facilities and hinterland connections at the ports in CAD to handle more commercial activities?

Another matter which has stimulated debate among the exert panel members was about the complexity of administrative process of water freight. The statement was Q11 ‘Do you think the complex administrative process of water transportation is having a negative effect on the development of water freight in CAD?’

The statement received almost equal responses among the expert panel members. 37.50% of them agreed that the complex administrative process is having a negative effect on the development water freight in CAD. 29.17% of them were against the statement and 33.33% of the expert panel members were unable to agree or disagree on it. In the opinion of expert panel members, the administrative process needs to be simple in nature. Currently it is a barrier for the development of water freight. The EU is trying to minimise and standardise port entry requirements. Like trucks, ships also can cross the borders with the same travel documents. The laws of the IMO and EU Directives are international. In others view-point current administrative processes are not complex and do not seem to hinder the current level of traffic at the ports. Once a company understands the process it is unlikely to have big impacts on water freight. Lack of understanding of the process by the companies and business is the main problem behind all the complexity of administrative process. Infrastructure issues need more attention than this. To achieve a consensus among the expert panel members the given statement has changed in to a new one as shown below

Q11 Do you think by streamlining and standardising complexity of port entry requirements of water transportation will have a positive effect on the development of water freight in CAD?

A statement regarding the government and the DFT attitude towards water freight in the SW UK was the next matter for discussion among the expert panel members. The statement was

Q12 Do you believe the growth of water freight in CAD is negatively affected by insufficient government incentives and inadequate promotion by the UK Department of Transport?

62.50% of them admitted that the growth of water freight in CAD is negatively affected by insufficient government incentives and inadequate promotion by the DFT. 16.67% of them disagreed in opinion about that but 20.83% of them had no comments about the statement. Most of the expert panel members had similar

opinion about the role of the Government and DFT in promoting water freight in CAD. They demanded more publicity for water freight from the government and DFT. According to the expert panel opinion the lack of interest from the government and DFT is due to the fact that the region has no major ports that are crucial to the UK economy. The DFT is not concerned with small ports. More support is needed for water freight because it is a sustainable mode. An initial outlay would definitely be required to get the network operational. Another reason to be considered here is the long-term costs which would ultimately be reduced compared to term cost of other transport modes. To promote water freight in the region a strategic decision about subsidy is necessary from the government and DFT. Very few expert panel members argued that government departments are well aware of the region's status. On a local and regional basis there are grants available from both UK and EU. Following the discussion, a new statement was formed to achieve a consensus among the expert panel members. The new statement is

Q12 Do you believe the growth of water freight in CAD is negatively affected by the limited interest of the government and Department of Transport?

The next statement was to check the socio-economic importance of water freight in CAD.

Q13 Do you think firms and society in CAD would benefit more from the usage of water freight in terms of competitive cost, integration across all regions, economic progress, overland congestion, added security, agility in customer delivery, compared to road transport?

The expert panel members had different opinions on the statement. 45.83% of them agreed on the statement, 29.17% of them disagreed and 25% of them were unable to comment. The statement was a mix of arguments. Most of the expert panel members gave their responses separately for each question. In the opinion of the expert panel members the advantages depend on trade patterns which evolve. The advantage of competitive cost is possible for the longer journey from

CAD to another region. Water transport has environmental advantages and it can integrate across all the regions. The security of goods is not a large issue in CAD. The region is ideally suited to water freight therefore customer delivery can be easily undertaken. At the same time some of the expert panel members suggested that the harbours would need capital injections to build suitable intermodal hubs and roads. The new statement formed from these suggestions is

Q13 Do you think the usage of water freight can produce short-term and long-term benefits such as sustainability, reduction in overland congestion, competitive cost, integration across all regions, and economic progress, compared to road transport?

A statement about the economic importance of water freight in CAD was the next topic for discussion among the expert panel members. The statement was

Q14 ‘Do you believe water freight is potentially a more important source of revenue and employment which can lead to the economic growth and prosperity of CAD compared to road transport?’

The responses of the expert panel members were almost equally distributed among the three options. 39.13% of them were agreed on the statement, 30.43% of them showed disagreement and another 30.43% of them had no opinion on the given statement. In their opinions, although water freight helps to improve economic growth in the region, any developments in water freight would depend on road and rail links to the port. To be effective, water freight must work with other forms of transport. Efficient local transport increases economic diversity. In the initial stage employment and sources of revenue will be localised with the development of water freight. In the longer term the interconnectivity with the world wide trading community will be beneficial to all. Better access to international trade for the micro-business of the region will increase exports with consequent effects on growth, revenue and prosperity. Increasing maritime transport could lead to increased employment both ship crew and also employment in ports. A few of them reported that there is little real cost benefit to

be found in the region now because the geography of CAD does not lend itself to efficient use of water transport and the demand is limited to the current bulk market. To achieve a consensus in this matter a new statement was formed based on the given information by the expert panel members. The new statement is

Q14 Do you believe if water freight is offered as an efficient and well planned alternative to road and rail transport it can lead to the economic growth and prosperity of CAD?

At the end of the Delphi round 1 survey all the expert panel members were asked to give their suggestions to develop water freight as an efficient and sustainable mode of transport in CAD.

They demanded government incentives, political initiatives encouraging strategic investment, public support for local port facilities, national/EU/Global promotion, facilitation of small scale water transport, development of small container systems, European grants, better road and rail connections, marketing and emphasis on environmental benefits. Companies need to be educated in the use of freight by water and attract super markets into the field. There must be research to identify what is being shipped, what quantities, and where from and to. Accordingly, the need for infrastructure can be realized. Also needed is to identify the main road traffic for top industries in the region and find out what water alternatives are possible with current and future infrastructure. Depending upon the volume of freight a dialogue can be encouraged between the councils and ports to understand the demand for infrastructure. Research to find out suitable routes for water freight to see how viable sea freight would be in the South West is important.

5.5 The Delphi Round 2 Results

The second round of the Delphi survey achieved a total of three consensuses among the expert panel members. A total of 14 statements had been given to the expert panel members to discuss and achieve consensus on each topic of discussion. In the second round of the Delphi survey a total 23 expert panel

members participated. One of the expert panel members who participated in the first round of the Delphi survey did not participate in the second round. The respondent informed the Delphi facilitator that due to lack of knowledge on the local ports and logistics industry in the region he could not contribute to the study as needed.

Delphi Round 2 survey responses are given in appendix B

5.5.1 Consensus Achieved in the Delphi Round 2

The second round of the Delphi study contained a total of 14 statements to achieve consensus among the respondents on the potential of water freight in the SW UK. After completing the second round of Delphi study a total of three consensuses were achieved.

5.5.1.1 Consensus Analysis 1

The first consensus that was achieved in the second round of the Delphi survey was the statement ‘Do you believe the presence of extensive coastline and accessibility to a number of ports along the length of the SW UK coast are supportive for water freight movements in the region?’. A discussion on the statement brought 78.26% of the expert panel members into an agreement on the topic. 17.3% of the expert panel showed their disagreement and 4.35% of the expert panel members were unable to comment. The statement was about the natural geography of the South West coast and its role in supporting water freight in the region. The SW UK has an extensive coast line and a number of ports are accessible along the coast. After the discussion, the majority of the expert panel members agreed that the geography of the SW UK supports water freight in the region. Findings of many previous studies and reports regarding water freight in the region suggested that water freight movement in the South West coast is less compared to other regions in the country. In such a situation asking about the importance of geography in supporting the movement of goods using water freight

collects experts' opinion on the issue and helps to follow their suggestions to improve the use of water freight in the region. The expert panel members' comments on the statement are given in appendix B

Most of the expert panel members agreed that, extensive coast line and lots of good natural harbors would support water freight movement in the SW UK. At the same time, they commented that it is not possible to develop water freight only with the help of these geographical features. Investments for port infrastructure and land transport links are very important. Many ports have little infrastructure. In the South West, roads and rail are not necessarily of a high standard. It is necessary to improve links from ports to the hinterland. Currently the small sized harbors and hinterland infrastructure limit the volumes per vessel and commercial viability of water freight. In the present scenario the minimum requirements for improving water freight are basic quay space with road access. It is beneficial to have distribution hubs and a customer base near port infrastructure to become more cost effective.

The suggestions of the expert panel members proved that the natural geography of the SW UK is an added advantage for water freight development. To utilize the potential of geographical features of the region there should be a proper planned infrastructure development at the ports and surrounding areas. A conscious effort for developing infrastructure and required facilities at the ports demands large investments. The consensus achieved among the expert panel members on the supporting nature of the geography of the region is a strong supporting evidence for demanding more investments in the region. More subsidies and tax benefits can be demanded on the basis of the consensus formed. The expert panel consensus helps to identify the untapped potential of the geographical possibilities for the betterment of water freight. With proper planning and developments in the infrastructure, water freight in the South west region can achieve a better market in the region. The availability of natural water freight supporting geography in the region reduces the cost of infrastructure. The

infrastructure development investment is greatly saved because of the available natural geography for undertaking water freight.

5.5.1.2 Consensus Analysis 2

The second consensus that was achieved in the Delphi round 2 survey is the statement five ‘Do you believe by using water freight, the cost of transportation can be reduced significantly for transporting bulk products long distance compared to road transport?’. 82.61% of the expert panel members were agreed on the statement. 8.70% of them were disagreed on the content of the statement and 8.70% of them had no opinion. The statement was asked to establish the inherent quality of water freight on moving large goods efficiently long distance. This basic characteristic of water freight helps to reduce the cost of transport very much. In order to find out the impact of this quality of water freight in moving bulk products long distance with less cost, the above statement was given to the expert panel members. Their discussion on the topic revealed that the cost of transportation for moving bulk products using water freight is cheaper than any other mode. According to their findings freight forwarders and logistics professionals can plan a better supply chain for their freight movement. The reasons to support the above statement among the expert panel members are given in appendix B

In the opinion of the expert panel, reduced cost of transport for transporting bulk products long distance is based on the principle of economies of scale. Ships are able to carry much large cargoes than road transport. Bulk products can be much cheaper if they are shipped by water. Cargoes such as china clay, cement, aggregates and agribulks already make use of coastal shipping for transportation. The use of water freight indirectly supports reduced costs both economically and environmentally. At the same time there are many factors that may affect the economies of scale of transporting bulk products long distance. They are; the time taken to transport goods may be longer, distribution requires road transport at some point, and the requirement for double handling could offset the expected

savings. So, one of the expert panel members suggested that economies of scale require 1500 tonne plus to be shipped at a time.

A consensus on the transport cost of bulk products transportation using water freight helps to identify different suitable bulk products currently using road freight which can change to water freight. Thus, congestion on the road can be reduced for long distances. A lot of other cost reduction is also possible by the transfer of bulk products transportation to water. Cost of accidents, cost of noise, cost of congestion, cost of pollution and cost of maintenance of public infrastructure are some of them. The transfer of bulk products from road into water produces not only a reduction in transportation costs but also many other environmental related costs. The reduction in different costs definitely reduce the price of the end products shipped using water freight. A proper planning in transferring bulk products movements from road to water ultimately increases the quality of life in the region.

5.5.1.3 Consensus Analysis 3

The final consensus achieved in the second round of the Delphi survey was on the statement regarding the benefits of using water freight in the short-term and long-term. The statement revealed that by using water freight as a mode of transportation, benefits such as sustainability, reduction in overland congestion, competitive cost, integration across all regions and economic progress are possible when compared with road transport. A total of 86.96% of the expert panel members were agreed on the statement, 8.70% of them expressed their disagreement and 4.35% of the expert panel members were unable to comment on the statement. Much research has been conducted on the benefits of water freight as a mode of transport. A number of studies were published with evidence of benefits of water freight using as a mode of transport. In the opinion of United Nations Economic Commission for Europe, the benefits of water freight using as a mode of transport include improved energy efficiency, reduced pollution, less highway congestion, improved road safety, and lower infrastructure expenditure,

increased vessel and slot utilization and ports throughput (UNECE, 2011). In the United States, water transportation is considered as the safest, least polluting and most cost efficient of all freight transortation (HighBeam Business, 2014). The congestion on road and rail networks is alleviated by water transportation and reduces the need for public sector infrastructure investments. Water freight helps to realize remarkable savings in fuel consumption, lessen air pollution from fuel combustion, leads to less traffic congestion, fewer accidents on railways and highways, and less noise and distruption in cities and towns (US Army Corps of Engineers, 2014). The statement given for debate of the expert panel members is given below

Q13 Do you think the usage of water freight can produce short-term and long-term benefits such as sustainability, reduction in overland congestion, competitive cost, integration across all regions, and economic progress, compared to road transport?

Explanations of the expert panel members for statement 13 in the second Round of the Delphi survey are presented in appendix B

From the explanations of the expert panel members given about the statement, in order to achieve these benefits, the initial investments would be large for renovating ports, purchasing vessels, planning routes, and strengthening inland links. So, it is unlikely to reduce the cost initially and all the benefits are generated in the long term rather than in the short term. To achieve benefits in the short term requires much investment. The consensus on the benefits of water freight among the expert panel members is a great motive for giving publicity for the increased use of water freight. The benefits of using water freight are reduction in congestion on the roads, competitive price, integration across the region, sustainability and economic progress. Based on the consensus there is a good chance to use the harbors and ports which have potential for conducting water freight. For a proper functioning of water freight requires large investments at the ports and road and rail tracks leading to the ports and surrounding areas. By focusing more on the

benefits of water freight to society professionals working in the shipping and logistics industry try to promote the use of water freight wherever possible. Increasing the demand for water freight automatically invite investments and other incentives for the development of water freight in the region.

The consensus formed here on the benefits of using water freight can be used for increasing awareness about the importance of water freight in society and people who are related to the shipping and logistics or related field. The use of water freight produces a better environment, congestion free roads, lower prices for goods, easy access to remote locations, and a better economy. A proper planned awareness program on the benefits of using water freight is very essential to boost the usage of water freight, and starting water freight at potential areas. An assurance about the benefits of water freight from well experienced professionals is a strong reason to utilize water freight more in the region.

5.5.2 Delphi Round 2 analyses of statements that did not reach consensus

The statement presented for discussion among the expert panel members was about the capability of water freight in the SW UK to support the transfer of road freight to water. The statement was ‘Do you think with the help of improved resources; water freight in the SW UK can support transfer of road freight movements to water?’ 73.91% of the expert panel members agreed that with improved facilities and infrastructure water freight in the SW UK can support the transfer of road freight in to water. 8.70% of them expressed their disagreement and 17.39% of the expert panel members had no opinion about the presented topic.

There was a common opinion among the expert panel members about the need for better infrastructure to develop water freight in the SW UK. According to them with sufficient port infrastructure and hinterland connection such as road and rail, efficient functioning of water freight is possible. Tax incentives or subsidies can

speed up the process of infrastructure development and offset economic barriers. After the development of the required facilities, the service offered by water freight could be reliable and cost effective to survive in the future. The expert panel also suggested that freight deliveries could be broken down into smaller packages which could reduce the movement of the largest lorries on the region's roads and it encourages maximum utilization of small ports in receiving small sized shipments. The different ways for promoting water freight are simpler ways of handling cargoes, port infrastructure investment in dedicated small scale unitization, investment in small short sea and coastal shipping. One real problem that may affect the development of water freight is insufficient density of population in the area to support the movement of freight effectively. Without demand, there is no significant return on capital investment to make it worthwhile. From the suggestions of the expert panel members, a new statement was formed for the third round of the Delphi survey. The statement is 'Do you think that with improved port infrastructure, subsidies and investments for making essential facilities, water freight in the SW UK can support transfer of road freight movements to water?'

The next topic of discussion was 'Do you agree that logistics professionals and freight forwarders need more information about the potential of water freight in CAD?'

The statement was asking about the need for logisticians and freight forwarders for more information about the potential of water freight in the SW UK. 73.91% of the expert panel members were positively replied to the statement. 8.70% of them expressed their disagreement and 17.39% of them had no opinion about the statement.

The general opinion of the expert panel members was that the logisticians and freight forwarders need more information on the potential of water freight in the SW UK. Information is always important to understand the availability of facilities in different ports and the cost of water transport compared to road and rail, how

packages of goods could be split for delivery to different destinations, and the time it would take to transfer goods between ports and help logistics professionals to make decisions on the type of transport to be used. By involving them directly in marine transport, professionals in charge of logistics are able to understand the potential of water freight better. Some of the expert panel members suggested that available information on water freight must be utilized for making people aware of the potential of water freight. Ports and related authorities should market available and hidden resources to get greater stakeholder engagement in water freight development. Marketing of the available potential of water freight can be developed as specific proposals to be considered by the concerned authorities. To achieve economies of scale in the shipment of smaller quantities of water freight, more information on the capabilities and possibilities of water freight is essential. Thus, a new statement was formed ‘Do you think logisticians, freight forwarders and other officials related to the water freight movements in CAD have to work for the betterment of the water freight industry in the region?’.

The next topic of discussion was the importance of integration of water freight into intermodal transportation to help the just in time and door to door delivery of time not sensitive cargoes. The statement was ‘Do you think integrating water freight into intermodal transportation will help, just in time and door to door delivery of time non-sensitive goods?’ In the expert panel members 39.13% agreed that integration of water freight in to the intermodal transportation is helpful to conduct just in time and door to door delivery of time not crucial goods. 39.13% of the expert panel members were opposed to the statement. The remaining 21.74% of them had no opinion to express about the statement.

From the suggestions of the expert panel members, integration of freight by water into intermodal transportation is a good thing. To begin with the integration of water freight in to intermodal transportation and just in time and door to door delivery of time non-critical cargoes, studies are needed to know how it might take place. For non-time critical goods, the integration of local water freight into intermodal transportation is beneficial and suitable. The development of smaller

scale unitisation standards can be beneficial for the development of water freight. Other demands for better services are proper connection between port facilities and the logistics chain. Facilities in ports such as machines to separate different cargoes or making smaller units for packaging or warehousing could make the process faster. Those who have opposite opinions on the topic for discussion commented that sea transport can be unpredictable, and weather can cause delays since just in time systems are time sensitive. At the same time international long distance freight shipments have intermodal arms and logistics/distribution business. They provide necessary services to their clients using their intermodal transportation. The new statement formed out of the discussion of the expert panel members is ‘Do you think that in ports with sufficient infrastructure and hinterland connections, integrating water freight into intermodal transportation will support just in time and door to door delivery of ‘time not crucial small batches of cargoes’?’.

Do you believe the potential of water freight as a mode of transport is under-utilized in CAD? was the debate topic for the expert panel members. A major part of the expert panel agreed that the statement is correct (73.91%). 4.35% of the expert panel members disagreed and 21.74% of the remaining members did not give any responses to the statement.

The expert panel members had many reasons for the under-utilization of water freight in CAD. The most important one is the lack of infrastructure at the ports and poor hinterland connections. The infrastructure in many ports is not capable of receiving large vessels and roads reaching to ports are not suitable for commercial traffic. Another reason is the lack of enough population density in the area and lack of sufficient demand for significant volumes of cargoes. Since there is less demand for goods, the preference of a base load is always for small shipments. Sometimes tidal constraints and weather conditions limit commercial viability. To increase the use of water freight requires incentives, public investment, and proper consideration by government/EU/global maritime authorities. More new information about the possibilities of water freight in CAD

also help to improve the current situation. To achieve a consensus on the given statement the statement was reframed to ‘Do you believe the potential of water freight as a mode of transport is very under-utilized in CAD?’.

Since a majority of the expert panel members agreed that the potential for water freight in CAD is under-utilized, the next statement given for a debate was about the difficulties to operate water freight in CAD. The statement was ‘Do you think water freight in CAD has to overcome many difficulties to operate to its full potential?’

The expert panel listed a number of difficulties in operating water freight in CAD. They are infrastructure issues, support from local communities, cost of operation, geographical difficulties, insufficient traffic to justify feeder services, difficulties for dredging and developing infrastructure due to highly environmental habitats in the coastal waters, managerial inertia, initial limited availability of core cargoes, low population, lack of industries, demand, economic issues, harbor size, limited wharfage, and warehousing, poor road and infrastructure in the hinterland, weather and tidal constraints and persuading interested parties might be challenging. To overcome these issues, the expert panel members have given many suggestions. They encourage original and independent thinking to find out practical solutions to each of the above mentioned issues. In the current situation, there are less than ten ports that are capable of receiving larger vessels. To reach full potential there should be an integration of water freight in CAD with other regions as well as national and European level. There needs to be a full assessment of what infrastructure is already available at the ports in the region, what facilities would be needed to develop and strengthen water freight is a solution for the insufficient infrastructure at the ports and hinterland connections. The new statement formed for achieving a consensus among the expert panel is ‘Do you believe water freight in CAD is facing many issues in its day to day operations due to insufficient infrastructure at the ports and poor hinterland connections?’

The importance of trained logisticians and freight forwarders in the water freight field was the topic of discussion in the next statement. The statement was ‘Do you think water freight in CAD would perform better if it has sufficient trained logisticians and freight forwarders in water freight?’ The statement was supported by 34.78% of the expert panel members, 26.09% of them expressed their disagreement and remaining 39.13% were unable to express their view point on the statement.

In the general opinion of the expert panel members, most businesses perform better with well-trained professionals, and suitably qualified and experienced personnel are always required in the shipping and logistics industry like any other industry. All transport/freight logisticians need to be trained in all forms of transport and also be trained from the available pool of people familiar with handling goods in ports. In one of the expert panel member’s opinion awareness of potential and the mind-set to undertake recognised risk are probably more important than logistics training, however training and awareness is unlikely to do any harm. A few of them commented that it is not clear with training to what extent the current disadvantages can be resolved. Massive investments are required to build infrastructure at the ports and to remove congestion on the roads. To find out solutions for the different issues that block the development of water freight in CAD requires trained personnel. Thus, based on the suggestions of the expert panel members the above statement given for achieving consensus among the expert panel members changed into ‘Do you think logisticians and freight forwarders can provide better knowledge about the potential of the water freight in CAD and demonstrate the market more clearly to its stakeholders?’.

A discussion on the current facilities and hinterland connections at the ports in CAD was conducted among the expert panel members. 52.17% of the expert panel members agreed that there is a lack of sufficient facilities and hinterland connections at the ports in CAD. The statement is disagreed with by 21.74% of the expert panel members and the remaining 26.09% had no opinion on the topic given for a discussion. The original statement is ‘Do you think there is a lack of

sufficient facilities and hinterland connections at the ports in CAD to handle more commercial activities?'

Most of the expert panel members agreed that there are enough ports in CAD but infrastructure and hinterland connections are sadly lacking due to lack of investment. More facilities are needed in many small ports. In the case of container operations there are presently no dedicated terminals with appropriate handling equipment. Connections between the hinterland and ports are poor. Road and rail connections to many ports are not up to handle current traffic levels. Road access to smaller ports is not able to accommodate large lorries. Additional facilities and connections out with the port area would help handling more services. So, it is beneficial to expand the road and rail network in order to utilize the capacity to its full potential. Bigger ports such as Plymouth are much better connected by road and rail. Investments are required to develop infrastructure at the ports and hinterland connections in the under developed ports in CAD. Based on the comments of the expert panel members the new statement is designed. 'Do you think due to lack of investments in port infrastructure, poor road and rail network connections to hinterland block the development of water freight in CAD?'

The next issue discussed among the expert panel members was 'Do you think by streamlining and standardizing complexity of port entry requirements of water transportation will have a positive effect on the development of water freight in CAD?' 52.17% of the expert panel members agreed that standardisation of port entry requirements will have a positive effect. 21.74% of them said standardisation of port entry requirements is not a significant barrier in the development of water freight and the rest of them (26.09%) had no opinion about the topic of discussion.

Streamlining of port entry requirements would be a progressive step, and any reduction in complexity makes a positive impact at all ports. At present different ports have different port entry requirements and ships sailing between different countries need to work on different papers. Over regulation can lead to decision-

making being made by office based personnel and not by the ships' captains and officers who are best placed to make such decisions. Standardisation of port entry requirements simplifies the entire processes and would encourage more companies into water freight. Other issues need to be considered for encouraging more people in-to water freight are high port costs, relaxation of ship inspections under Paris MOU (memorandum of understanding) on port state control, security and issues for illegal migrants and many different levels of regulations. Some of the expert panel members commented that port entry requirements had already made less complex and all straight-forward for any competent logisticians or agent. It is unlikely that much could be changed easily as it has to apply to what is basically an international business with most commercial vessels trading internationally. Simplification of port entry requirements do not directly impact the user of the service would be handled by the vessel operators or agents. From all their comments and suggestions, a new statement is formed for the third round of the Delphi survey. The new statement is 'Do you think different levels of regulation (International, EU, National, Regional) and port costs will have a negative impact on the growth of water freight in CAD?'

The next statement was 'Do you believe the growth of water freight in CAD is negatively affected by the limited interest of the government and Department of Transport?' 60.87% of the expert panel members said the statement is true whilst 21.74% of them were against the statement. The remaining 17.39% of the expert panel members had no opinion about the statement.

The expert panel members shared their views on the interest of government and DFT in water freight in CAD. According to them, many of the officials believe CAD are more suitable for leisure than commercial purposes. The South West is getting minimal political interest. As far as the government and political parties are concerned the South West ends at Bristol. London and the Midlands are the only areas important to the DFT and they are primarily interested in the landward perspective. The government is influenced by the success of the larger ports and does not give enough consideration to the small and medium sized regional ports.

There are incentives available for other transport modes and significant investments are focused elsewhere in the country. Unless positive messages which lead to assistance come from the Department of Transport then things are unlikely to change. Those who were against the statement suggested that the SW UK is not a high density or high production area. There have been efforts by the DFT under 'Freight by Water' to encourage entrepreneurship in the use of water as a means of transport. This needs to be developed for coastal shipping also. The major part of the expert panel members was asking the EU to make more progress on water freight. Thus, a new statement is formed which is 'Do you agree that the government and the DFT have the responsibility to develop innovative ideas and offer more financial support to maximise the use of small and medium sized ports in CAD?'

'Do you believe that if water freight is offered as an efficient and well planned alternative to road and rail transport it can lead to the economic growth and prosperity of CAD?' was another topic given for debate among the expert panel members. The statement was approved by 69.57% of the expert panel members. Whilst 21.74% of them expressed their disagreement and 8.70% of the panel members were unable to comment about the topic.

From the comments and suggestions of the expert panel members it is evident that sea transport and short sea shipping have great potential in counties like CAD. It has the potential to be a world leader in small scale freight movements by sea, however the problem lies with cost effectiveness and the suitability of port infrastructure. Transportation costs to the region, relatively low concentrations of freight for each destination, complications of terms of sale and land based issues are the present barriers in developing the industry in the area. Water freight can lead to the economic growth and prosperity of a region in conjunction with a coordinated economic policy. The use of waterborne transport in the movement of super market goods is the best example for that. With the support of economic incentives, improved transport and freight options would help the growth of CAD. The ports have a positive impact on the economic development of a society, but

benefits would be more apparent in the future. These suggestions and opinions helped to form a new statement for to achieve a consensus among the expert panel members. The new statement is ‘Do you believe if water freight is offered as an alternative to road transport with sufficient port infrastructure and hinterlands connections it will be beneficial to the economy of CAD?’

In the last part of the Delphi round 2 survey the expert panel members were asked to provide their suggestions and proposals to develop water freight in CAD. They gave many recommendations for the betterment of today’s water freight in CAD.

Suggestions from the expert panel members for developing water freight in CAD need special attention from shipping and logistics industry and the government. According to the proposals the government can introduce tax incentives, subsidy payments to encourage water freight and promotion of coastal shipping in the region can be done better with the support of the government machinery. Another important suggestion was the requirement of a collaborative partnership between all ports in the region to handle extra cargo. The willingness to work together enables even greater utilisation of the ports regardless of their size and capacity. Along with the provision of feeder port container capability would increases opportunities for more water transportation in CAD. A market survey of the major importers and exporters of manufactured goods and proper understanding of what freight actually moves in the area, and what can support that freight and its logistical needs help to identify present and future expansion plans required to attract more potential customers in to water freight.

Water transportation is a successful mode of transport in many European countries. Research into European coastal shipping and small scale unitisation and a discussion about the relative total costs or benefits of water vs road transport can be done to increase awareness about the benefits of using water freight among the public. A new class of marine vessel regulation for coastal/inland waters craft with weather and tide restrictions can also increases the chances of using more water freight in the region.

5.6 Delphi Round 3 Results

The third round of the Delphi survey provided a total of 10 statements to the expert panel members to discuss and achieve consensus. From that one consensus was achieved among the expert panel members on the topics of discussion. In the third round of the Delphi survey a total 22 expert panel member participated. One of the expert panel members who participated in the first and second round of the Delphi survey did not participate in the third round. Each panellist was reminded by the Delphi facilitator three times once the third round of the Delphi survey started. There was no response received from the respondent regarding the absence from the last and final round of the Delphi survey.

Delphi Round 3 survey responses are presented in appendix B

5.6.1 Delphi Round Three, Consensus Analysis

The third round of the Delphi study contained a total of 10 statements to achieve consensus among the respondents on the potential of water freight in the SW UK. The survey achieved one consensus among the expert panel members. The reasons for poor water freight movements in CAD were discussed among the expert panel members. The statement given for this discussion was ‘Do you think due to lack of investments in port infrastructure, poor road and rail network connections to hinterland block the development of water freight in CAD?’. As a result of the discussion among the expert panel members 77.27% of them approved the reasons given in the statement for the slow growth of water freight in CAD. There were 9.09% of the expert panel members had different opinion about the reasons of slow growth of water freight in CAD and 13.64% of them were unable to express their views about the statement.

The two previous Delphi survey rounds suggested that the presence of an extensive coastline in CAD is supportive for water freight movements in the region. The benefits of water freight such as sustainability, reduction in overland

congestion, competitive cost, integration across regions, economic progress, reduced cost of transportation for transporting bulk products, and more labour, energy and fuel efficiency are agreed among the expert panel members in the Delphi surveys. The recent statistics of DFT shows the growth of water freight is very low in CAD compared to other parts of the country. The statement given for discussion among the expert panel members was intended to find out the importance of well-developed port infrastructure, road and rail network connections in the development of water freight in CAD. The majority of the expert panel members agreed that, the lack of investments in port infrastructure and poor road and rail network connections to hinterland block the development of water transport in CAD. They had given many suggestions to improve water freight in the region, many other reasons for the under developed conditions of water freight in CAD and possible solutions to overcome these drawbacks.

Explanations of the expert panel members for statement seven in the third Round of the Delphi survey is given in appendix B

According to the expert panel members' observations, all important ports have appropriate hinterland connections. Water freight in the South West is connected to Southampton on the South coast and Bristol to the North. Both rail and road tend to align themselves East West. The rail network has limits imposed between Cornwall and Devon (Brunel's Bridge) and there is no motor-way west of Exeter. Without the development of better roads and rail links in the region proper functioning of water freight is not possible. When a local water freight system is established, better port infrastructure and improved links would follow. Investment in port infrastructure is dependent on freight throughput to pay for it, and freight throughput is dependent on the ability of the port and its infrastructure to service. The developments in road and rail are likely to decrease the need for water freight because better inter regional roads reduce the journey times by HGVs. To survive the competition from HGV road transport, it would be good if many existing simple quays could be utilised as very local delivery points. Another reason is, small individual consignments from micro-businesses do not currently lend themselves

to developing waterborne transport, and this is made more complicated by the multiplicity of terms of sale, which dilute what cargos there are into many different decision-makers globally.

The development of water freight in CAD needs investments in port infrastructure, and better road and rail network connections to the hinterland. The consensus achieved among the expert panel members on the above point is a strong reason to give much priority in the improvement of infrastructure at the ports. From the previous rounds, more consensus was achieved among the expert panel members on the sustainability, efficiency and suitability of water freight for transportation of bulk products than road transport. As a green alternative to road transport, water freight can work efficiently and effectively only when there will be sufficient infrastructure and proper connectivity to hinterland. According to the statistics (DFT, 2013), currently water freight is used for transporting wet and dry bulk in the region. Yet many HGVs are running on the road carrying petroleum products especially for super-market giants. Once the infrastructure and hinterland connectivity are properly developed to meet the criteria for moving large quantity of goods using water freight the movements of HGV carrying wet products in the region can be replaced. Thus, the environment and society in the region can enjoy all the qualities and benefits of water freight. Once the ports are ready with all their resources, opportunities to exploit those facilities follow automatically. The consensus achieved on the reason for poor functioning of ports in the region is an eye opener to authorities in the shipping and logistics industry. It would be more ideal for the transfer of present HGV movements to water as much as possible using better developed water freight, than waiting for new demands to rise in the region to make developments at ports and in the hinterland.

5.6.2 Delphi Round 3 Analyses of statements that did not reach consensus

The first statement given among the expert panel for the debate was ‘Do you believe the potential of water freight as a mode of transport is very under-utilized

in CAD?' After the discussion, it was revealed that 63.64% of the expert panel members believed that the potential of water freight in CAD is very under-utilized while 27.27% of the expert panel disagreed to the opinion of the major part of the panel and 9.09% of them had no opinion on the given topic of discussion.

The expert panel members had different reasons to explain under-utilized situation of water freight in CAD. According to them the whole of the South West is surrounded by the sea and the potential of water freight in CAD is large. However, all freight is carried by road and water freight is very under-utilized. The infrastructure of CAD ports is not sufficient for waterborne freight. The geography of CAD would offer inherent benefits to coastal shipping. There are potential areas of short sea shipping/coastal shipping yet to be developed. There could be more short sea shipping to ports as hubs for shorter transportation by road or rail. This could be a useful means of transport for non-time critical low value high volume freight. Incentives and investments for the development of infrastructure at the ports increase its capacity for freight movements. There is capacity for freight to be transported to larger ports, broken in-to smaller loads and then transported to smaller ports on general or small cargo ships. Increased use of water freight would ease road and rail congestion and bring new business to ports.

The next statement was 'Do you think with improved port infrastructure, subsidies and investments for making essential facilities, water freight in the SW UK can support transfer of road freight movements to water?' based on the percentage of agreement, disagreement and unable to comment options for expressing the expert panel members opinion, 68.18% of them agreed with the given statement, 13.64% of the expert panel members expressed their disagreement and 18.18% of them were unable to comment.

The common opinion of the expert panel members was that with improved port infrastructure, subsidies and investments for making essential facilities, water freight in CAD can support transfer of road freight movements to water. Improved port infrastructure and a reduction in duty/taxes to enable freight to be transported

by sea and along rivers to the hinterland, would be beneficial to the road networks by easing congestion and environmentally better as there would be less air emissions. Subsidies are necessary to encourage modal shift due to costs of double handling. There are many small ports around the coasts of SW UK that require investments in facilities for change of use and distribution would need ability to handle parcels, pallets and less than container or truck loads. Government expenditure on marine traffic has not equalled that on road and rail. Support for the water freight at EU level would be needed and regularity and frequency of the waterborne offer are also important deciding factors in the continuous use of water freight. Those against the statement argued that the volume of demand is too low in the region and the need for road transport for endpoint delivery and collection add extra mode transfer costs and are uneconomic.

A discussion on the issues of water freight's day to day operations in CAD was conducted among the expert panel members. The statement given for discussion was 'Do you believe water freight in CAD is facing many issues in its day to day operations due to insufficient infrastructure at the ports and poor hinterland connections?' The result was 59.09% of the expert panel agreed that the mentioned problems in the statements are true in practice, 22.73% of them disagreed with the statement and the remaining 18.18% of the expert panel members did not express any opinion.

Apart from the three main ports of Plymouth, Fowey and Falmouth in CAD all other ports depend on small roads to access them and commercial traffic has to compete with leisure traffic. Ports require appropriate cranes for loading/unloading of freight. They may also require warehousing or goods transfer facilities. Roads linking ports to the main road network are generally poor and infrastructure investments reflect restricted opportunity for commercial gain. The expert panel members who were agreed with the given topic said that lack of consideration of ports, their infrastructure and connectivity is certainly one issue that needs to be recognised. On the other hand, the expert panel members who

were against the statement believed that the present infrastructure and demand means that the issues raised are relatively minor and further investment would not be cost effective. As per their observation the ports in CAD have a reasonable infrastructure, the current level of traffic is adequately supported by existing facilities. Since there is less demand there is no point investing in ports and hinterland connections.

The next topic was asking about the importance of logisticians, freight forwarders and other officials related to the water freight industry in promoting water freight movements in CAD. The statement was 'Do you think logisticians, freight forwarders and other officials related to the water freight movements in CAD have to work for the betterment of the water freight industry in the region?' a majority of the expert panel members supported the statement (72.73%), whilst 9.09% of them expressed their disagreement and 18.18% of the expert panel members had no opinion to express about the importance of professionals' involvement in the water freight industry.

The suggestions of the expert panel members revealed that the water freight sector only progresses with common actions from all the stakeholders because it currently is not very utilised. Shipping is always a better alternative than road when the logistics requirements of each mode are satisfied. All those who are involved in sea freight in the region were in favour of promoting this form of transport wherever possible as it is inherently fuel efficient and low impact in terms of space and congestion on land. A wider strategic approach is needed to educate the professionals about the possibility of water freight because without their support changes in transport modes will not happen. As long as the true costs of road transport are ignored, including carbon costs, the freight forwarders and others have to work hard to encourage greater use of waterborne transport. It could bring great rewards eventually.

The role of logisticians and freight forwarders in marketing the potential of water freight among its stakeholders was the topic given to the expert panel for debate.

The statement was ‘Do you think logisticians and freight forwarders can provide better knowledge about the potential of the water freight in CAD and demonstrate the market more clearly to its stakeholders?’ 59.09% of the expert panel members agreed that logisticians and freight forwarders can promote water freight among the stakeholders and provide better knowledge about the potential of it. Whilst 13.64% of them did not ready to approve the statement and 27.27% of them had nothing to say about it.

From the comments of the expert panel members, logisticians and freight forwarders have a clear understanding of what they need to make their activities efficient and profitable. They should therefore understand what benefits can be gained through the use of water freight compared to other transport modes and this general knowledge of the industry should be transferrable to a specific region. Historically the industry is slow to communicate with its stakeholders, so they would need to undertake further research it before they could present the market to stakeholders. Thus, they can be more informed themselves and able to rethink about all options not just road and rail. At present due to lack of suitable tonnage and cost structures based on international shipping, water freight is rarely chosen. A few options are presented by the expert panel members to increase the use of waterborne transport. They are proper marketing of the concept of water freight and more information would help stakeholders to have firmer views. Develop a new standard small scale unitisation to fit 3.5 and 7.5 tonne gross light trucks such as two-tonne and four-tonne gross containers and a new class of economical, low powered, lightly regulated vessels to run on short distance multi-port routes for example even tug or barge combo vessels.

A discussion about the impact of regulations and port costs on water freight in CAD was conducted among the expert panel members. The statement presented before them was ‘Do you think different levels of regulation (International, EU, National, Regional) and port costs will have a negative impact on the growth of water freight in CAD?’ The result of the discussion was 40.91% of the expert panel members did not find any impact from regulations and port costs in the growth of

water freight in CAD. Whilst 36.36% of them believed that the growth of water freight is negatively affected by the regulations and port costs. Among the expert panel members 22.73% of them had nothing to express regarding the given statement.

From the expert panel members' suggestions, regulation and cost are associated with all transportation. Usually regulation is not a significant issue; it has an impact on road transport as well as water freight and nothing extra for waterborne transport. Water freight provides potential economies of scale even taking these regulations into account. Much of the regulation is safety or environmentally related such as from the MARPOL Convention on pollution from ships, including standards for shipping, to the EU Directives on port reception facilities for ship generated waste, integrated maritime policy, EU blue growth agenda etc. There is also the EU policy to increase the use of short sea shipping to move goods and measures to increase regional cooperation between ports. Interpretation of international regulations can differ widely between authorities. A clear understanding of the range of legislation and measures that impact on the industry are necessary to provide a better playing field for all players. More than regulations, marketing and investments could help water freight to grow faster and better. Those who agreed with the statement argued that too many rules, regulations, bureaucracy, red tape, duplication, form filling and report writing make it a complex system that needs simplification to make it more attractive to potential business users. The governments' red tape challenge provides an opportunity to analyse and eliminate out-dated regulations and to assess existing regulations to make them clear and acceptable for purpose (Brownrigg, 2015). Port costs, cost of double handling, ECA regulations and UK implementation of EU legislation create diverse impacts on water freight and ports such as competition between ports, short sea shipping more expensive etc. for example; the weight regulation and costs of a small scale commercial ship and a Heavy Goods Vehicle (HGV) are unequal which leads to the unyielding driving up of vessel sizes.

The role of the government and DFT in developing water freight in CAD was another topic of discussion among the expert panel members. The statement given for discussion was ‘Do you agree that the government and the Department of Transport have the responsibility to develop innovative ideas and offer more financial support to maximise the use of small and medium sized ports in CAD?’ The result of the discussion was 63.64% of the expert panel members agreed that the government and DFT have roles in developing water freight in CAD. At the same time 22.73% of them disagreed about the involvement of the government and DFT in water freight industry and 13.64% of the expert panel members had nothing to say about it.

According to the expert panel members, the government and DFT have a shared responsibility with industry to promote water freight. The government can help develop innovative ideas through funding mechanisms. An effective policy to promote water freight including overcoming cost and other barriers can only be achieved at government level. Some of the more significant burdens on smaller ports are compliance with national and EU legislation which would either require significant investment in staff or systems. So, the EU, the government and DFT have the responsibility to provide substantial support and cooperation to promote and develop waterborne transport in the country. The EU has a strategy to hep initiate new waterborne services between European countries which could be used in the development of the small and medium ports in CAD. It is the responsibility of the industry to come up with proposals and then bid for funds from the government and EU. The ports serve local communities and can provide jobs and economic benefits to society. Therefore, it would seem appropriate that DFT commissions research into innovative ideas around small and medium sized ports and support industries that want to invest in them. It would help a lot and could make a difference in the growth of water freight. Those who were against the government and DFT role in the development of water freight stated that too much government involvement can be a problem by masking and hiding underlying problems. Ports have powers to raise money from users and to borrow.

The UK port industry is market led so it is up to ports themselves to develop business opportunities.

The next topic given for a discussion among the expert panel members was ‘Do you think if ports with sufficient infrastructure and hinterland connections, integrating water freight into intermodal transportation will support just in time and door to door delivery of ‘time not crucial small batches of cargoes’?’. The result was 45.45% of the expert panel members agreed that water freight will support just in time and door to door delivery of time not crucial small batches of cargoes if the ports have sufficient infrastructure and hinterland connections. Whilst 18.18% of them were against the statement, 36.36% of the expert panel members had nothing to suggest on the topic.

From the explanations of the expert panel members’ water freight is best suited to non-time critical cargoes. Better hinterland connections improve door to door delivery. The accessibility of the hinterland by water is influenced by tides, and as a result the goods can only be transported inland as and when water levels are high enough. Proper infrastructure and operational systems could potentially make the water based aspects more reliable and therefore more practical for use. This type of water freight system operated successfully across many countries in the EU. Some of the expert panel members were uncertain about the statement given for the discussion. As per their opinion water transport still relies on road networks to get to its final destination so it would not be gaining on reliability. The distance around the coast and tidal windows are critical for just in time delivery of goods. The main flows in the region are wet and dry bulk so there is limited demand for intermodal in this region.

The possibility of making economic benefits using water freight as a mode of transport was the last topic of discussion among the expert panel members. the statement given for a discussion was ‘Do you believe if water freight is offered as an alternative to road transport with sufficient port infrastructure and hinterland connections it will be beneficial to the economy of CAD?’ The result of the

discussion was 72.73% of the expert panel members agreed the statement is true, 13.64% of them did not agree the idea behind the statement and another 13.64% of the expert panel members were unable to comment the statement is true or not.

According to the expert panel members' opinion, reduction in road congestion as a result of improved water freight movements in the region is economically beneficial. Less congestion enables freer movements around the area encouraging more leisure activities which bring financial advantages to the economy. There is also an increase in port employment and local distribution opportunities which could be beneficial to the industry. Local jobs would be created in the ports and in shipping industries and an increase in maritime activity would also benefit the region with its traditional involvements in this area. Water freight when it starts to compete with road transport with improved port infrastructure and hinterland connections would give business greater flexibility. It may attract business to move large amount of materials such as supplies and products which up to now may have been put off by remoteness and poor connections. There were some diverse opinions which also emerged in the discussion about the statement. From their view point the cost of making improvements would be high which could benefit nobody. If the cost is low it would create huge externalities such as noise, congestion, accidents etc. There is little extra manufacturing and trade to make a large difference in the early stages. Presence of too many hauliers with associated trades could pay off with benefit to the local economy.

5.7 The Delphi study summary

The Delphi study achieved a total of eight consensuses and below is a quick summary of the consensuses results.

An increase in water transportation will reduce the negative impacts on the environment and external costs caused by road transportation and increases sustainability (Agreement of 79.17%, Round 1)

Complete integration of water freight in the logistics chain is difficult (Agreement of 79.17%, Round 1)

Water freight is a sustainable green alternative to road and rail (Agreement of 87.50%, Round 1)

Water freight is more labour, energy and fuel efficient than road transport (Agreement of 78.26%, Round 1)

The presence of extensive coastline and accessibility to a number of ports along the length of the SW UK coast are supportive for water freight movements in the region (Agreement of 78.26%, Round 2)

Using water freight, the cost of transportation can be reduced significantly for transporting bulk products long distance compared to road transport (Agreement of 82.61%, Round 2)

Using water freight as a mode of transportation benefits such as sustainability, reduction in overland congestion, competitive cost, integration across all regions and economic progress will be possible when compared with road transport (Agreement of 86.96%, Round 2)

Due to lack of investments in port infrastructure, poor road and rail network connections to hinterland block the development of water freight in CAD (Agreement of 77.27%, Round 3)

A total of nine statements did not reach the consensus level (75%) in the Delphi study. Those statements were as follows

If water freight is offered as an alternative to road transport with sufficient port infrastructure and hinterland connections, it will be beneficial to the economy of CAD (72.73%)

Logisticians, freight forwarders and other officials related to the water freight movements in CAD have to work for the betterment of the water freight industry in the region (72.73%)

With improved port infrastructure, subsidies and investments for making essential facilities, water freight in the SW UK can support transfer of road freight movements to water (68.18%)

The potential of water freight as a mode of transport is very under-utilized in CAD (63.64%)

The government and the Department of Transport have the responsibility to develop innovative ideas and offer more financial support to maximise the use of small and medium sized ports in CAD (63.64%)

Water freight in CAD is facing many issues in its day to day operations due to insufficient infrastructure at the ports and poor hinterland connections (59.09%)

Logisticians and freight forwarders can provide better knowledge about the potential of the water freight in CAD and demonstrate the market clearly to its stakeholders (59.09%)

If the ports with sufficient infrastructure and hinterland connections, integrating water freight in to intermodal transportation will support just in time and door to door delivery of time not crucial small batches of cargoes (45.45%)

Different levels of regulation (International, EU, National, Regional) and port costs will have a negative impact on the growth of water freight in CAD (36.36%)

The next chapter presents an interpretation of each round of the Delphi results, discussions and conclusions of the Delphi studies results based on the research objectives.

Chapter 6. Interpretations and discussions of the Delphi results

The purpose of this chapter is to provide an explanation of the results achieved in the three Delphi rounds. The eight consensuses, its implications to the industry and society were discussed. Statements that did not achieve consensus also examined since the experts' panel members had expressed their views and suggestions from their established industry experiences. Conclusions formed for each statement were related to the objectives of the study.

6.1 An interpretation of results of the Delphi Round 1

The first round of the Delphi survey consisted of a total of 18 statements based on the objectives of the research. A total of 24 expert panel members participated in the survey. As a result, the Delphi survey achieved a total of four consensuses in the first round. The first four statements which achieved consensuses among the expert panel members are 'Do you think water freight is a sustainable green alternative to road and rail?' (87.50%); 'Do you believe an increase in water freight transportation will reduce the negative impacts on the environment and external costs caused by road transportation and increase sustainability?' (79.17%); 'Do you think water freight is more labour, energy and fuel efficient than road transport?' (78.26%) and 'Do you believe complete integration of water freight in the logistics chain is difficult?' (79.17%)'. There were 14 statements in the first round Delphi survey that did not achieve consensus.

From these consensuses, it is understood that water transport is an efficient and sustainable mode of transport. These qualities suggest that water freight is a major future mode of transport. As water freight produces very negligible quantity of greenhouse gasses to the environment, the use of water freight instead of road freight could reduce the impact of pollution on society. Since water freight is more efficient in the usage of fuel, labour and energy compared to other transport, by adopting water freight as one of the components of a supply chain, the cost of

transportation can be reduced significantly. Likewise, the external costs of water freight in terms of noise, congestion, accidents, damage and maintenance of infrastructure are inherently low. Other advantages of water freight are safety, lowest environmental costs, time reliability, reduced infrastructure costs, high carrying capacity, high potential for intermodal networking, a large available capacity, suitability for transporting abnormal loads, and possibilities for tailor-made transportation, over other modes of transport. From the Delphi study conducted on the potential of water freight in the SW UK, the expert panel members realized the potential of water freight in the region. Yet at present the SW UK is going through very low water freight movements. From the explanations of the expert panel members the major problem faced in the integration of water freight in a logistics chain is none other than the attitude, unchanging mentality, resistance to accept changes and unwillingness to make it happen. By creating awareness about the qualities of water freight among the freight forwarders and logisticians the use of water freight in the industry will increase.

The statements that did not achieve consensus in the first round of the Delphi survey brought considerable information from the expert panel members on various aspects of water freight in the SW UK. As per their opinion, though the SW UK has an extensive coast line suitable for water freight, restrictions in the infrastructure, poor inland links, lack of funding, insufficient local population at ports or industry, lack of deep water, high tidal range/low draft, the attitude of users of water freight and lack of original thinking to handle small cargoes by water, block the maximum use of water freight. At the same time the poor conditions of road and rail infrastructure in the region increase the importance of water freight in the SW UK. To support the transfer of road freight to water freight, ports in the region are not large enough, have insufficient infrastructure, less private roads and need to spend high costs for handling cargoes. Other issues such as cheap road pricing, double handling requirement, high fixed costs of modal transfer, poor road network, and possible delays need to be resolved for supporting the transfer of road freight to water.

At present in CAD water freight is used for the transportation of dry and wet bulk. Many wharves are unused and many ports in the South West cannot accommodate large shipments of cargo because of draught requirements. There are very few port locations able to facilitate ship to shore transfer from container feeder ships in CAD. There is no dedicated LO-LO container terminal and ports have not been designed for inward transportation. The hinterland connections are poor due to lack of sufficient road and rail infrastructure. To change the situation requires great infrastructure improvement, planning support, subsidy for the waterways, marketing, public support and better knowledge about water freight. The facilities at the ports would need to be bought up to legal commercial standards for handling of large vessels.

Transportation of heavy bulk products using water freight for long distance could be cheaper because vessels carry more goods than road transport and there are no delays and congestion at sea. Usually ships can discharge goods much closer to their final location cutting out a large amount of the travel time and distance which would reduce the overall transport costs. The extensive coast line in CAD would be helpful in just in time and door to door delivery of less value cargoes where time is not a critical factor. It is possible to conduct door to door and just in time delivery of less value cargoes only when the overall multimodal costs are lower than road costs and the frequency of services and reliability have to be competitive compared to other modes of transport. Water freight helps to improve economic growth in the region. The developments in water freight would increase local employment and revenue in the initial stage. In the longer term, increasing maritime transport could lead to increased employment, revenue, and international trade.

The logisticians and freight forwarders can learn more about the potential of water freight in CAD by conducting further research on its present situation, requirements, future development opportunities, new uses, and sharing information among the professionals. The lack of knowledge about the potential of water freight among the logisticians and freight forwarders arises (a) because

people who are responsible for conducting water freight are not ready to find out the new uses and possibilities for its better use, (b) within the current commercial and legislative framework it is difficult to consider shifting road freight to water; (c) the economies of water transport are negated by costs of transhipment and regulatory burden on sea shipping; (d) short sea shipping/feeder services are more expensive and can be weather dependent; (e) large investment would be needed; (f) logisticians use flexible road freight to apply just in time methods; (g) and the recent trend to turn port facilities into marinas restricts the available options. Giving training on the potential of water freight for logisticians and planners is relevant for the betterment of water freight. It encourages them to change their attitude towards water freight and work for the advancement of infrastructure. Simple administrative processes at the ports would help to attract more potential users to water transportation. Proper understanding of the administrative processes helps logisticians and other professionals to save time and money at the ports.

As a sustainable mode of transport water freight needs more support and publicity from the government and DFT. Though there are no major ports crucial to the UK economy, small ports in the region really need subsidy, and incentives, from the government and DFT to promote water freight. Support from public, national/EU promotion, facilitation of small scale water transport, development of a small container system, better roads and rail connections and marketing water freight by giving emphasis on environmental benefits are required to attract more potential users such as super-markets and companies in the shipping and logistics industry. Research to find out the main bulk cargo movements on the roads in the region and suitable routes for water freight to see how viable sea freight would be in the South West is important.

6.2 An interpretation of the Delphi Round 2 results

The second round of the Delphi survey consisted of a total of 14 statements based on the results of the first round Delhi survey. A total of 23 expert panel members

participated in the survey. As a result, the Delphi survey achieved a total of three consensuses in the second round. The three statements which achieved consensus among the expert panel members were, ‘Do you believe the presence of extensive coastline and accessibility to a number of ports along the length of the SW UK coast are supportive for water freight movements in the region?’ (78.26%), ‘Do you believe that by using water freight, the cost of transportation can be reduced significantly for transporting bulk products long distance compared to road transport?’ (82.61%) and ‘Do you think the usage of water freight can produce short-term and long-term benefits such as sustainability, reduction in overland congestion, competitive cost, integration across all regions, and economic progress, compared to road transport?’(86.96%). There were 10 statements that did not achieve consensus among the expert panel members in the second round of the Delphi survey.

The consensus on the above mentioned statements emphasises the natural geography of the region and its importance in water transportation. Considering all the advantages of the region’s geography, a proper development plan can lessen the cost of infrastructure expansion at the ports and hinterland connections. The naturally available facilities at the ports help to develop a better market for water freight movements in the region. The cost of transportation for transporting bulk products long distance using water freight is less than road transport because of the economies of scale. By using water freight instead of road transport give not only the benefit of reduced transportation cost but also reduction in external costs such as cost of accident, cost of noise, cost of congestion, cost of pollution and cost of maintenance of public infrastructure. More than all of these benefits the price of the product which is shipped using water freight is less compared to other modes of transport and result in a better quality for life in the region. Consequently, water freight is able to offer economic benefits. From these consensuses, it is understood that water freight has many advantages compared to other modes of transport and by highlighting all the advantages of water freight in the logistics industry this could increase its use in CAD.

The statements that did not achieve consensus in the second round of the Delphi survey were formed based on the explanations given by the expert panel members to the statements in the first round of the Delphi survey. Thus, each statement received more clarifications from the expert panel members in the second round and consequently the second round of the Delphi survey brought more information about the difficulties blocking the use of water freight in CAD despite the fact that that consensus was not achieved. Lack of investment causes many infrastructure problems to conduct water freight properly. At present there are no dedicated terminals with appropriate handling equipment to handle container operations. According to the expert panel members cost of operation, difficulties for dredging and developing infrastructure due to highly environmental habitats in the coastal waters, initial limited availability of core cargoes, low population, lack of industries, less demand, weather and tidal constraints obstruct demand for water freight in the region. To achieve economies of scale in the shipment of smaller quantities of water freight, more information on the capabilities and possibilities of water freight is essential. More than these issues CAD receive minimal political attention from the Government and DFT. They consider that the region is better suited for leisure than commercial activities. To solve these issues an integrated policy for water freight in CAD with national and European interested parties is helpful.

The second round of the Delphi survey also produced many options to develop water freight in CAD. Other than infrastructure developments, improvements in hinterland connections, tax incentives and subsidies, the expert panel members suggested smaller packages of cargoes to maximise the utilization of small ports, investment in dedicated small scale unitization and investments in short sea shipping and coastal shipping like ‘Freight by Water’. The integration of water freight in to intermodal transportation is helpful for door to door and just in time delivery of time not critical cargoes. Water freight can provide better service when the connections between different port facilities and the logistics chain are improved. By knowing more about details of the basic needs, demands,

requirements of water freight and a comparative study on the qualities of different modes of transport help logisticians and professionals related in the field to conduct water freight successfully. Training in all forms of transport enables transport/freight logisticians with a fixed mind-set to approach the recognised risks and find out practical solutions for the different issues that block the development of water freight. Sharing their knowledge about the potential of water freight among the stakeholders create awareness of using water freight in the future.

Standardisation or simplification on over regulation, high port costs, ship inspection under Paris MOU (memorandum of understanding on port state control, for security, for illegal migrants) and many different levels of regulations (international, EU, national, regional) would encourage more users into water freight. There are many other possibilities for increasing the usage of water freight in CAD such as a collaborative partnership between all ports, encouraging through limited subsidy, a provision for a feeder port, a market survey to find out major importers and exporters, their freight moves in the region and what can support that freight and its logistical needs, a conversation about the relative total costs/benefits of water vs road transport, a study of inland waterways in Europe to learn lessons in public support, trying to persuade international maritime regulators to instigate a new class of marine vessel regulation for coastal/inland waters craft (probably with weather restrictions) and finally develop the Maritime & Waterborne Innovation Group as an organisation to work for the development of water freight and co-ordinates all activities in the region.

6.3 An interpretation of the Delphi Round 3 results

The third round of the Delphi survey consisted of a total of 10 statements based on the results of the second round Delphi survey. A total of 22 expert panel members participated in the survey. As a result, the Delphi survey achieved one consensus in the third round. The statement that achieved consensus among the expert panel members was ‘Do you think that due to lack of investments in port infrastructure, poor road and rail network connections to the hinterland block the

development of water freight in CAD?' (77.27%). There were nine statements that did not achieve consensus among the expert panel members.

The consensus on the above mentioned statement proved that the most important reasons for the slow growth of water freight in CAD are the lack of sufficient infrastructure and hinterland connections. To enjoy the benefits of water freight such as sustainability, reduction in overland congestion, competitive cost, integration across all regions, and economic progress, the use of water freight must be increased in the region. A practical solution to improve the investments in the port infrastructure and hinterland connections is very important in the present situation. Conducting awareness programmes among the public and in the industry, help to create interest in water freight. When there is a strong demand for water freight, there are many opportunities to satisfy the required infrastructure development with a hope to receive profit from it. Seeking support from the government and DFT for tax benefits and incentives is an option to use for the development of water freight in the region. Europe has different projects to help water freight. Applying for those funds is more helpful in making infrastructural developments at the ports. Ultimately an increase in the use of water freight is a strong reason for the development of infrastructure at the ports. To increase the use of water freight, encourages the industry to receive the benefits of water freight and become a messenger of sustainability to help the environment and society, is the best way to increase the usage of water freight. The use of water freight to transport goods can be used to create loyalty among the customers. A comparative study of advantages and disadvantages of water freight and road transport helps the industry to choose water freight for the transportation of bulk products long distance.

The third round of the Delphi survey also followed the same method of statement formation as in the second round of the Delphi survey. Accordingly, from the explanations of the expert panel members given to the second round of the Delphi survey statements, the third round Delphi survey statements were prepared. During the third round of the Delphi survey, discussion on each statement brought

broader perceptions. Thus, the expert panel members had a strong opinion about the under-utilization of water freight in CAD. According to their opinion although ports in CAD have enough potential for conducting water freight such as coastal shipping, short sea shipping, to transport freight to larger ports, and smaller loads to smaller ports on general or small cargo ships, all these possibilities of water freight are blocked due to the lack of infrastructure in the region. The opportunity for transporting non-time critical low value high volume freight using water freight is also affected by insufficient infrastructure at the ports. The day to day operations at the ports require appropriate cranes for loading/unloading of freight and warehousing or goods transfer facilities. Interpretation and proper understanding of regulations at various levels (International, EU, National and Regional) related to safety or environment is very important to attract the potential users of water fright. Sometimes complications in understanding different legislation and port entry requirements can lead to loosing potential users of water freight.

In the third round of the Delphi survey also the expert panel members continued to claim that the best way to increase the use of water freight is the development of port infrastructure, to get investments and subsidies and a reduction in taxes for making essential facilities. Support from the EU and regularity and frequency of service are also important deciding factors in the continuous use of water freight. The availability of better port facilities and hinterland connections helps the door to door delivery of non-time critical cargoes. To increase the use of water freight needs collective actions from the logisticians and freight forwarders by highlighting the qualities among all the stakeholders. In order to conduct promotional activities for water freight, professionals in the industry need to be educated about the possibilities and benefits of water freight to change the market mentality towards water freight. Since the shipping and logistics industry is slow to communicate with its stakeholders, a proper marketing of water freight by the logisticians and freight forwarders among the stakeholders would help to increase the popularity of it. Other available options are to develop a new standard small scale unitisation to fit 3.5 and 7.5 tonne gross light trucks such as two tonne and

four tonne gross containers and a new class of economical, low powered, lightly regulated vessels to run on short distance multi-port routes.

The government and DFT have shared responsibility in promoting water freight in the region. Developing innovative ideas, overcoming cost, investments in staff, and conduct research and support industries that want to invest in ports are some of the duties of the government and DFT to support water freight in the country. The EU has a strategy to help initiate new waterborne services between European countries which could be used in the development of the small and medium ports in CAD. The ports serve local communities and can provide jobs and economic benefits to society. There are more business opportunities when water freight starts to compete with road transport with improved port infrastructure and hinterland connections. The increased usage of water freight results in less congestion on the roads, an increase in port employment, local distribution opportunities, and maritime activities.

The main criticism in developing water freight in CAD received was, the population and volume of demand in the region is too low to support an increase in water freight. Therefore, the investment for making necessary infrastructure does not receive its return from the usage of water freight. Water freight has many advantages over road freight still for endpoint delivery and collection it needs road transport and the use of an extra mode results in extra costs.

6.4 The Delphi results: a discussion

The ultimate aim of this research is to find out the possibility for water transportation in the SW UK especially in CAD. As an effective method of data collection to gather information, observations and opinions about the future of water freight from the experts in logistics and shipping industry, the Delphi method was used in the research. Consequently, a total of eight consensuses achieved on the topic of the potential for water freight in CAD. These consensuses reveal present scenarios of water freight in the region and provide in-depth awareness

about the necessary requirements needed to increase future demand for water transportation in CAD. A detailed discussion on the achieved consensuses helped us to understand precisely the importance, possibilities and limitations of water freight in the region based on the objectives of the research.

6.4.1 Consensus about the nature of water freight in SW UK

The first objective of the research was to examine the nature of water freight in SW UK, especially in CAD. The consensus achieved on the above mentioned objective, during the Delphi study revealed that the presence of extensive coastline and accessibility to a number of ports along the length of the SW UK coast are supportive for water freight movements in the region. The expert panel members also expressed their views in the present status of water transportation in CAD. According to them the SW UK coast has a number of good strategically spaced natural harbours. Most of the ports are small in size. Only a few ports have the required draught to support large vessels. Most of the industry in the region is smaller scale necessitating container size or less such as pallet sized shipments to multiple destinations. Though the expert panel members support water freight in CAD, they strongly argue for many necessary developments in the ports and related facilities for a better future in water transportation.

The Delphi study encouraged its participants to contribute their genuine thoughts to the study. Thus, the expert panel members' suggestions and views for the development of water freight are the main highlights of this research. Their proposals were formed from their own experiences, knowledge and expectations in water transportation industry. According to their opinions, in South West land transport links (road/rail) is not necessarily of a high standard. The underdeveloped road and rail infrastructure could provide a more supportive environment for water freight if there would be an effort to improve port facilities and links from ports to the hinterland. Thus, it is now very clear that an extensive coastline is important, but ports with basic quay space, sufficient infrastructure to handle cargoes and improved road/rail access to hinterland are very important

factors to make progress in water transportation in CAD. In the South West there are basic port facilities available approximately every 20 miles. This is an essential favourable factor for water freight which can be exploited only when the limited possibilities of ports in CAD could be changed by attracting both public and private investments for better port facilities.

6.4.2 Consensus on the contributions that water freight could make to the logistics industry in SW UK

The second objective of the study was to evaluate the contributions that water freight could make to the logistics industry in SW UK. There were two consensuses reached on the main contributions that water freight offers to the logistics industry during the Delphi study. As per the expert panel members' agreements, by using water freight the cost of transportation can be reduced significantly for transporting bulk products long distance compared to road transport and an increase in water transportation reduces the negative impacts on the environment and external costs caused by road transportation and increase sustainability. The literature review conducted at the beginning of the research identified the same contributions of water freight to the logistics industry. A study conducted by Yang et al in 2013 proved that water freight is a viable means of reducing CO2 emissions and lowering external costs and is consequently regarded as one of the most sustainable and economically competitive modes of transport. According to Browne et al (2007) promoting and encouraging the use of non-road modes for freight transport reduce the negative impacts of environmental and external cost and increases the sustainability of logistics strategies. Also, it is recognised that water transport is certainly the cheapest mode of transportation nowadays because the unit transportation costs incurred is smaller than road and railway transport, which is a result of high energy efficiency and reduced need for workers (Platz, 2008).

To increase the use of water freight, creating awareness about the benefits of water freight among the public is very important. At first professionals related to

shipping and logistics industry must understand the pros and cons of using water freight in CAD. Research to identify the statistics of relative benefits and costs of water transportation to road transport can be used for this purpose. Though water freight offers less environmental impacts, marine diesel is generally more polluting in terms of sulphur content. Also, emissions from very small ships are higher than big ones. By using cleaner fuel, pollution from ships can be avoided. In this situation the International Maritime Organization (IMO), the governing body of international shipping, has made a decisive effort to use cleaner fuels with less harmful effects on the environment and human health. In effect from 2015, ships operated within the Emission Control Areas (ECAs) contain the Economic Exclusive Zone of North America, the Baltic Sea, the North Sea, and the English Channel will begin to use Marine Gas Oil (MGO) with acceptable sulphur content up to 1,000 ppm. Starting from 2020, ships sailing outside ECAs will shift to Marine Diesel Oil (MDO) with permitted sulphur content up to 5,000 ppm (ICCT, 2014).

Usually cleaner fuel is more expensive and to replace marine diesel to cleaner fuel requires economic incentives. EU is offering financial support to switch from marine diesel to greener fuels in the ships. Some of the available financial support includes TEN-T and the Marco Polo Programmes, as well as the European Investment Bank (EIB) which gives financial support to green maritime-based projects (European Commission, 2012). Since the United Kingdom is a member of EU, these financial assistances would be beneficial to water freight industry in CAD in the transformation of cleaner fuel ships. An idea to build the logistics infrastructure locations near the departure and arrival ports helps to reduce the negative impacts further down.

To reduce the transportation cost of bulk products long distance significantly by using water freight compared to road transport in CAD depends on some other factors also. Since the demand for cargoes are less because of the limited population in the region, developing correct sized vessels and small containers to ship small quantities would save cost of transportation, time, and effort of work force. Another issue which needs attention is the lack of sufficient hinterland

connectivity in the ports in CAD. Insufficient road and rail links to ports and various locations can offset the advantages of any transportation cost savings due to double handling requirements. To gain all benefits of using water transportation, proper development of infrastructure requires special attention in the region.

6.4.3 Consensus on the challenges blocking potential logistics companies from using water freight as their modes of transportation

Examining the challenges obstructing potential logistics companies in utilizing water transportation as their modes of transport is one of the important objectives of the study. Since most of the expert panel members were related to the practical aspects of the water freight industry, they clearly pointed out the drawbacks of water transportation to attract more potential customers for using it as their modes of transport. Based on their experiences and knowledge they agreed that due to lack of investments in port infrastructure, poor road and rail network connections to the hinterland block the development of water freight in CAD. These circumstances in CAD led the expert panel members to believe that complete integration of water freight in the logistics chain is difficult. Some of the expert panel members argued that better road and rail infrastructure could diminish the importance of water transportation because developments in road and rail transportation reduce the journey times further down compared to water freight. Reliability and frequency of service are very important for a successful logistics chain. At present some external factors other than hinterland connectivity and sufficient port infrastructure such as weather, additional handling etc. restrict the speed, reliability and frequency of water freight in the region.

In this situation improving the reputation of water transportation in CAD requires considerable planning. Creating awareness among the management in the logistics and shipping industry and general public about water freight as an environmental friendly mode of transportation and its various gifts to society and its economy compared to other modes of transport would be the first step. To strengthen the confidence in water transportation many working models of water

freight in the EU can be explained using various mass media. In the EU there are lots of good working models to follow and could adapt various characteristics required for a well-functioned water transportation system operating in similar locations like CAD. Once the officials of transportation and freight industry express their interest to promote water freight as a future mode of transportation, it would be much easier to attract potential customers into the water freight business. The government must take initiative to insist every freight companies to start a department specially dedicated for making their business more sustainable using environmental friendly modes of transport wherever possible. In order to encourage them for using water freight as their sustainable modes of transport, offers such as subsidy, tax incentives and similar rewards would be useful.

When freight companies, shipping and logistics industry started to use water freight for achieving environmental and societal benefits by neglecting their possible minor loses could result a hike in their goodwill growth and they become more acceptable to the general public. Automatically, increased popularity can provide more business opportunities and generates big profits also.

6.4.4 Consensus on the socio-economic impact of water freight

Water freight gains more importance among other modes of transportation because it offers a number of benefits to society and the environment. Studies conducted by Yassin et al, 2010; European Commission, 2013; Valois et al, 2011; Garratt, 2004 etc. were clearly mentioned about various benefits of using water freight compared to road and rail transport. Thus, an analysis of water freight socio-economic impacts in CAD became an objective of the study. By doing so the research aimed to find out the benefits water freight could offer and how important these benefits are compared to road and rail transport to the region. The three consensuses formed during the Delphi study revealed that water freight is very useful to society and environment. According to the consensuses water freight is a sustainable green alternative to road and rail and it is more labour,

energy and fuel efficient than road transport. The usage of water freight can produce short-term and long-term benefits to society and the environment including sustainability, reduction in overland congestion, competitive cost, integration across all regions, and economic progress compared to road transport.

Water transport could offer all the above mentioned benefits compared to other modes of transport. To achieve the complete advantages of water freight in CAD needs large initial investment for necessary infrastructure developments at the ports, planning routes, purchasing vessels, ports renovation and strengthening inland links etc. Consequently, the financial benefits of using water freight may be less in the initial stage. A study would be helpful to find out how competitive costs can be obtained from the use of water transportation in terms of cost of congestion, health impacts, environmental taxation etc. when transferring road freight into water. Another suggestion to encourage an increase in the usage of water freight is to impose a carbon tax on road transport. This would provide an economic incentive for an alternative, more sustainable waterborne system of transport.

The geography of CAD provides a unique coastline to the region. So, the area is ideally suited to water freight. An effort to make developments in the ports infrastructure and hinterland connectivity create more port employment and potentially increase local distribution opportunities in the region. Consequently, the creation of jobs during the development process of ports and waterways could put more money into the local community, which largely spend locally too, helping the area to develop and modernise. As water transportation becomes efficient in its operation this could lead to many other achievements also. It provides business with greater flexibility and better customer delivery options to move its supplies and products to remote locations where poor connections hinder its flow. This result in a reduction in road freight and less congestion on the roads. Less congestion will enable freer movement around the area, encouraging tourist and local activities which in turn benefit the local economy. A reduction in the road transportation would reduce the amount of sound and environment pollution,

accidents, and health impacts. These benefits of water freight to the environment and society make it as a sustainable mode of transport in the freight industry.

The study aims to promote water transportation in CAD irrespective of explanations that the amount of population and their demands for goods are insufficient to favour large scale water freight in the region. The research provides an opportunity to encourage transfer of maximum possible road freight into water with the current infrastructure and motivate professionals in the shipping and logistics industry to work for the betterment of water transportation to attract potential customers with improved port infrastructure and hinterland connectivity with the help of suggestions and advice from the experienced professionals in the industry.

6. 5 The statements which nearly reached consensus in the Delphi study

During the Delphi study the consensus level was fixed at 75% to get a real picture of water freight in CAD. Some of the statements achieved consensus at 70% to 74%. The purpose of this section is to discuss those statements to identify the reasons which blocked the statements in achieving consensus among the expert panel members. A total of six statements achieved consensus ranging from 70% to 74% in the Delphi study. These statements also provide considerable information about water freight in CAD. An in-depth exploration of each statement is given below.

Statement 1

Do you think water freight in CAD is facing problems to utilize its full potential? (Agreement of 70.83%, The Delphi round 1)

The statement was framed with a general viewpoint about the issues water transportation is facing in CAD. No specific problems were mentioned in the statement which might help the respondents to identify limitations of water freight in the region. There are many difficulties blocking water transportation to utilize its

full potential in CAD. Lack of infrastructure and investments, poor hinterland connectivity, small harbours, tidal and weather constraints, focus of local councils on tourism, attitude, lack of thinking globally in ways to handle small cargoes by water, and insufficient planning support and knowledge amongst logistics providers were identified as major problems in utilizing the full potential of water freight in the region. To promote water transportation in CAD requires public support, subsidy and marketing of it amongst potential customers. From the expert panel members' comments, it was revealed that a detailed presentation of issues faced by water transportation in CAD could have helped to achieve consensus in the first round of the Delphi study.

Statement 2

Do you think with the help of improved resources; water freight in the SW UK can support transfer of road freight movements to water? (Agreement of 73.91%, The Delphi round 2)

This statement was similar to the above statement; it presented a very broad view of the substance to the audience. The expert panel members were asked for more information about the term used in the statement 'improved resources'. A brief explanation of the term 'improved resources' could have helped the expert panel members to achieve consensus in the given statement without difficulty. The first round of the Delphi study collected large amounts of information regarding the issues faced by water transportation in CAD. By revealing options to resolve these issues such as sufficient port infrastructure, better hinterland connectivity, tax incentives, subsidies, and investment in dedicated small scale unitisation etc in the given statement, the expert panel members might reach consensus more easily. At the same time the statement motivated the expert panel members to provide their suggestions to improve water freight in SW UK and limitations of water transportation that need attention while improving the resources such as insufficient population density in the area, geography, and low market demand.

Statement 3

Do you agree that logistics professionals and freight forwards need more information about the potential of water freight in CAD? (Agreement of 73.91%, The Delphi round 2)

The statement was intended to identify whether logisticians and freight forwarders are aware of the potential of water freight in SW UK. As the agreement shows 73.91% of the respondents expressed their opinion as logisticians and freight forwarders need more information on the potential of water freight in the region. Only two of them (8.7%) disagreed on the statement saying that there is already extensive knowledge and information available to professionals in the industry. At the same time comments from the expert panel members revealed the importance of information that the logistics professionals need to be able to make a decision on the type of transport to be used. At present cost is the only variable the professionals are looking at while doing their business. Information on different aspects of water freight such as availability of facilities in different ports, cost of water transport compares to road and rail, any subsidies available for water freight as a green alternative to land based transport etc would be very useful to persuade them to change the mode of transport used. By using the available information about the possibilities of water freight could encourage an increased use of it, thus the advantages of economies of scale become evident to the potential users of water transport.

Statement 4

Do you believe the potential of water freight as a mode of transport is underutilized in CAD? (Agreement of 73.91%, The Delphi round 2)

The given statement was designed to test whether the capacity of water freight as a mode of transport is fully utilized or not in the region. Almost 74% of the expert panel members agreed that the potential for water freight is under-utilized in CAD. Only one (4.35%) expert panel member expressed disagreement on the

given statement. The expert panel members were given a number of explanations to the specified statement as reasons for the limited usage of water transportation in the region. According to the experts the major causes of the limited water freight in CAD are; significant road traffic, just in time delivery of small batches, no basis of large shipments as a base load, insufficient infrastructure and hinterland connectivity, low population density and lack of significant volumes, no incentives, tidal constraints and weather conditions and lack of information. Every reason has minor, medium or substantial influence in the low usage of water freight in CAD. A short description about the present circumstances of water transportation in the region with the given statement could have brought consensus among the expert panel members much easier. Even though the expert panel members who participated in the Delphi study were experts in the shipping, logistics, supply chain and related industry, a briefing on every statement given in the Delphi surveys could have helped them to reflect better.

Statement 5

Do you think logisticians, freight forwarders and other officials related to the water freight movements in CAD have to work for the betterment of the water freight industry in the region? (Agreement of 72.73%, The Delphi round 3)

It is very clear that any industry could perform its best only with the help of its professionals. They are the backbone of an industry. The statement given to the expert panel members also produced the same view about the contributions of the logisticians, freight forwarders and officials related to water freight industry. They have to work hard to encourage greater use of waterborne transport wherever possible as it is inherently fuel efficient and low impact in terms of space and congestion on land. Without their support changes in transport modes will not happen. Professionals in the industry must be educated and more informed about the possibilities of water freight rather than an obscure old method of transportation. 72.73% of the expert panel members shared the same opinions about the role of logisticians and other professionals in promoting water freight in

CAD but two of them (9.09%) had expressed their disagreement with the statement. According to them the professionals related to water freight movements have to serve their customers not a mode of transport. In the real world, the customer focuses on achieving the right service at the right price, time and place from their service providers. In this situation if the customers are not very keen on the mode of transportation, the service providers in water freight industry can offer their services using waterborne transportation without compromising on customers' satisfaction. To provide better service using water freight there should be enough infrastructure at the ports and better hinterland connectivity across the region. A favourable condition for water transportation could be developed only with common actions from all the stakeholders in the industry.

Statement 6

Do you believe if water freight is offered as an alternative to road transport with sufficient port infrastructure and hinterland connections will it be beneficial to the economy of CAD? (Agreement of 72.73%, The Delphi round 3)

The percentage of agreement on the given statement indicated that with the help of sufficient port infrastructure and hinterland connectivity, water freight could transport goods in the region and it is beneficial to the economy of CAD. Three expert panel members had different opinions about the given statement. According to them the cost of improvements would be high, and the resulting gain could be small to produce profit by doing the business. Consequently, there would not be any economic advantages to society by conducting water transportation at a higher cost of improvements. On the contrary the majority stated that with improved infrastructure would provide greater flexibility and could attract more business in to water transportation. At present the cost for developing infrastructure requires large amount of investment in the region. Once it is developed the gains from it automatically start to grow. Like every business a saturation period is normal in this case also. By spending a huge amount on the

expansion of water freight a lot of benefits such as local jobs would be created, increased local distribution opportunities, encouraging more tourist activities, and an increase in port employment ultimately would beneficial to the local economy. A foresight for a fruitful economy by the improvement of water transportation in the region is essential to start designing the process which needs to be done in this case. Examples of successful stories of water transportation in different parts of the world could motivate professionals and officials related to waterborne transportation in CAD.

Discussions of statements which achieved consensus of between 50% and 70% and the statements which failed to achieve consensus beyond 50% in the Delphi study are presented in Appendix C

The objectives of the study and conclusions of the Delphi survey results

The purpose of this section is to discuss the results of the three Delphi surveys in relation to the objectives of the study and to develop final conclusions from the results. Since this research demanded maximum level of agreement among the expert panel members for better judgments on the potential of water freight in CAD, the consensus level was fixed at 75%. When 75% of the expert panel members agreed a statement, consensus was achieved. Thus, in the Delphi, a statement that reached 75% of agreement or more, did not enter the subsequent round. Statements that did not achieve consensus in each round of the Delphi survey were entered into subsequent rounds by changing the statements according to the explanations received in the previous round as reasons for agreement or disagreement with the original statements. The conclusions formed from each round of the Delphi survey are given in Table 6.1, 6.2 and 6.3 in appendix D

6.6 The Delphi process: an evaluation

The research on the potential for water freight in the SW UK has successfully used the Delphi technique to address its objectives. As a result, reliable results are formed to understand the present status of water freight in the region. Within this specific maritime policy context, features of the Delphi method such as interactive nature, avoidance of group bias and the occurrence of group thinking scenarios helped to increase reliability of the results. Each statement was designed to motivate each expert panellist to contribute their genuine opinion. Their interactions and group thinking from their vast experience and knowledge in each topic of discussion helped to maximise the probability of achieving reliable responses. The Delphi process began with the selection of suitable experienced experts in maritime policy and the number of participants far exceeded the minimum number required. As the panel size increases the reliability of the end result also increases (Clayton, 1997). To confirm the reliability of the Delphi results a parallel form of testing involved a focus group with experts of similar characteristics who confirmed the significance of each consensus formed during the Delphi study.

Mimicking prior studies in maritime policy Delphi methods offered the most suitable means for gathering relevant exploratory data. Due to limited prior academic studies within the precise context of this study, in this exploratory work the Delphi technique generated accurate assessments within an interacting group of experts. The technique motivated a group of anonymous participants in a quick and efficient way to share their knowledge, skills and experiences into the decision-making process without any geographical limitations. From the experience of conducting three rounds of Delphi study it was realized that this technique generates vast amounts of reliable, relevant and valid data from a group of the most experienced and knowledgeable people, which is available for further analysis. Thus, the Delphi study is a strong tool for reaching reliable, valid and

trustworthy outcomes within the specific context of this particular study involving maritime policy.

The researcher first realized the potential of using the Delphi method in the research by conducting a literature review on the characteristics of the Delphi process, its advantages, and how it works in an uncertain area of study. However, some pitfalls have occurred during the administration of the Delphi process. A brief detail is presented below.

Although, the researcher followed all the criteria for conducting the Delphi study as described in many academic studies, with hindsight a few modifications may have assisted. Delphi methods offer no specific written rules within which to conduct a study, but some common guidelines are available. The panel size as per Turoff's (1975) opinion, should range from ten to fifty and in a heterogeneous population 15-30 is recommended (Martino, 1972). The researcher approached more than 200 experts in the water freight related area but only 29 showed interest. These included 13 industry experts, 12 academics, two researchers and two politicians. Within a maritime policy context, this number is ideal, although had the study domain extended to "integrated transport planning" for example, additional recruits from retail, manufacturing, logistics service provider and transport sectors would have been appropriate. Panellists brought extensive working experience in their respective fields ranging up to 40 years. Arguably, the study may have been more representative if the representations of the four categories of expert panel members had been more equal. The number of participating researchers and politicians differed from the number of subject experts and academics but inevitably, there are very few specialist researchers and politicians available.

As a policy work, this study used the Delphi method to collect primary data to develop future maritime policy in water freight. Even though panel members from the road freight companies, retailers, manufactures, major logistics company are appropriate for conducting this Delphi study, it will not be valid to ask their opinion because they are not a part of maritime policy background to express reliable information to form future maritime policy for water freight. As part of the transport industry they have an interest in water freight development for a better integrated transport world. Maritime policy is not about simple economics of mode choice, like transport transfer mode price, or revealed or stated preference economics relating to price level. Expert panel members from road freight companies, retailers, manufacturers or major logistics companies would be more ideal for forming integrated transport planning which is wider than the maritime policy framework.

The three Delphi surveys consisted of statements to encourage the expert panel members' independent contributions to the topic of discussion. The researcher tested each statement with the help of two experts in the industry before distributing the survey. Nevertheless, two statements caused some confusion for two to three panellists. The statements which created some confusion incorporated multiple dimensions. One such statement aimed to collect experts' opinions on the benefits using of water freight and included a list of relevant benefits. The other statement concerned the possibility of using water freight to move just-in-time and door-to-door delivery of non-time-critical goods. With hindsight, these statements may have been too broad and contained mutually exclusive wordings. Re-writing focusing on the main theme of the statement with a brief explanation below the statement, may have clarified the meaning for panellists. In future work, it is important to avoid long statements, and to ensure that statements for evaluation are as clear as possible.

The limited usage of water transportation in CAD necessitated that the researcher should gather a high level of consensus on each statement to get a true picture of water transportation in the region. Thus, it was decided to fix the agreement

level at 75% generating consensus on eight statements; at 70% this would have increased to 14. According to Butterworth and Bishop (1995) consensus is when majority of the participants come to an agreement. As per this explanation, consensus can be reached when 51% of the participants express their agreement on a given statement. In this situation keeping 70% agreement for consensus confirmation would be ideal to represent a real status of the discussed statement among the participants. Thus, from the experiences of conducting the Delphi study, in future the researcher would prefer to keep 70% of agreement for reaching consensus.

Reliability refers to the consistency of a measure of concept (Bryman and Bell, 2015). External and internal reliability measures confirm the consistency of the research results. External reliability attains when replication of the study to verify the results generates the same results as the original study in future usage. In this situation for an exploratory maritime policy study, the results overall were the most reliable available at the time, but replication now may generate different results simply because the business and political system has changed. For example, uncertainty over SSS with Brexit and loss of the European methodology of public subsidy to fund a pilot infrastructure project have changed the business context. Changes in social, political, economic and cultural settings of the world, country, region, and society influence the opinions of the expert panel members who participated in the Delphi study. According to LeCompte and Goetz (1982) it is impossible to freeze a social setting and circumstances of an initial study to make it replicable. For every qualitative research this limitation is applicable and agreed while measuring external reliability of the study (LeCompte and Goetz, 1982). As a result, the current study also faces the same limitation of an inability to freeze a social setting and circumstances of an initial study to make it replicable.

Internal reliability refers to the agreement among the research team about what they see and hear (Bryman and Bell, 2015). The Delphi study is designed in such a way as to collect agreements among the expert panel members on the topic of discussion. Thus, this study achieved a total of eight important consensuses to

develop water freight in the SW UK. The number of participants for the study was higher than the minimum standard number recommended for Delphi research, which also helped to ensure a reliable study. The process of the Delphi method demands maximum agreement from participants to reach consensus on a statement. An experienced expert panel from the shipping and logistics industry shared similar thoughts and suggestions on the given statements for discussion. Consequently, this study received internal reliable consensus which should contribute to new maritime policy for the development of water freight in the region.

This study used self-completion questionnaires to collect expert panel members' answers to the research topics. Many advantages such as cheap to administer, quicker to administer, absence of interviewer effects, no interviewer variability and convenience to respondents helped to reduce the chance for different types of bias in answering the questionnaire. Bias such as interviewer effects and social desirability bias, did not affect the answers of respondents because no interviewer was present when answering the questionnaire. Characteristics such as ethnicity, gender and the social background of the interviewer can affect responses but with no interviewer involved, these were nullified. Also, the absence of an interviewer helped respondents to become comfortable, to reduce their anxiety and to complete the questionnaire as and when they wanted, at the speed that they wanted.

Even though the use of the self-completion questionnaire offered many advantages to the study, some of the limitations of these questionnaires are noteworthy. The absence of the researcher when respondents were completing their questionnaire excluded opportunities for prompting, probing, collecting additional data and asking more questions about their opinion on a given statement. As a result, some of the respondents did not answer questions which did not interest them. Also, there is a chance that someone else could have completed the questionnaire. Although all these restrictions might have applied to this research, the selection of appropriate experts due to their expressed interest

in the research topic would lessen the impact of the above-mentioned limitations in the study. Each question was framed in such way that it was easy to understand; sufficient space was given to provide their suggestions and the guidelines for each statement, and in each round the expert panel members opinions were considered for framing the next round of questions.

As a primary data collection method, the usage of the Delphi study in this exploratory research was appropriate because of the nature of the research problem and very limited availability of the academic literature in this field. Three rounds of the Delphi study were conducted which is appropriate to keep the consistency of the agreement among the expert panel members. Thus, this research accumulated accurate and reliable information about the nature of water freight in the SW UK, contributions of water freight to the logistics industry, challenges blocking potential logistics companies in using water freight as their modes of transportation, the socio-economic impact of water freight, and managerial solutions in developing water freight as an efficient and sustainable mode of transport in SW UK.

The next chapter discusses the process of the focus group discussion, findings and a discussion on the findings of the focus group.

Chapter 7 Focus group within the study

Five members of the Maritime and Waterborne Innovation Group participated in the focus group. They are eminent professionals, actively engaged in the shipping and logistics industry with experience ranging from 16 to 58 years. The focus group started at 12 noon and lasted for 90 minutes. A short questionnaire was used to record participants' personal and professional information. All focus group members actively participated in the discussion. They analysed the Delphi findings in detail and shared their experiences, knowledge and ideas for improving water freight in the region in a friendly atmosphere. All group discussion data were recorded and written notes on important information shared in the focus group were compiled by the researcher as facilitator.

7.1 Findings of the focus group

The themes developed during the focus group based on the Delphi study included 'results of the Delphi study, recommendations to promote water transportation, policies for water freight, issues in policy formation and implementation and further research topics for promoting water freight in the region'. Each theme covers a range of suggestions, concerns, hopes and practical solutions to develop water transportation in the SW UK. These themes provided an understanding about the potential for water freight in the SW UK. The findings are described under the heading of each theme. Where appropriate the construction of the content through interaction between focus group participants has been shown.

Participants were asked to discuss the results of the Delphi study. The significance and trustworthiness of the findings were debated. Their discussion extended the initial findings of the Delphi study with detailed explanations of the current practises, issues and challenges water freight is facing in the region.

7.1.1 Results of the Delphi study

Three rounds of the Delphi surveys achieved a total of eight consensuses (agreement above 75%) and six statements achieved consensuses between 70 to 74% among the expert panel members. Focus group participants collectively upheld the significance of the Delphi results noting that.

‘This study could apply almost to anywhere especially places where there are regional hiccups. In some areas, there are some complicated issues, if we can crack on here, then other areas of similar restrictions on marine frame could benefit from what we do’.

Port infrastructure and hinterland connections

Participants noted that the SW UK has limited port facilities in Falmouth and Plymouth and is limited in many ways without some rather expensive infrastructure costs.

Participant 1: …there are limiting factors with specific ports, you know, I am also [doubting] their ability to handle large freight at all. …we think we need to identify the port which can be invested in deepening and expanding berths, cranes etc. If we have such things, then we could have something to sell and we get to identify that we had an aged maritime [infrastructure] in Torquay.

Participant 2: I agree I mean historically ok, the transport in South West was mainly maritime so it is one of the inputs of the road systems, which in fact we lost the railway systems in many ports, there are limitations but there is I think opportunity in the large ports still. We are not making use best of that.

Participant 3: We have no simple handling shipping structures which will enable us just to run a cheap operation across that very short stretch of water. The other issue associated with that is that the SW ports suffer from access port land.

Participant 4: yes, you got to do something about it unless it got to be earning enough money big in-order to afford the deepening of it etc. so this is a sort of chicken and eggs thing

Participant 5: it is relatively a small population compared to the country as a whole. And it is quite a spot population. So, we do have these problems.

Aside from the literature review and the Delphi study the focus group revealed significant new insights. There are opportunities for water freight in the SW UK with limitations, but the industry is not making the best of them. The focus group identified that water freight is getting strong competition from road and rail in terms

of costs. Roads in the UK are subsidised. The road transport lobby is very-very powerful, and any politician is not ready to stand against it. Britain's rail system requires a lot of money to try and upgrade from Victorian system to cope with the modern trains which can be utilized for hinterland connectivity at the ports. At present ports in the region have no simple handling shipping structures which enable them to run cheap operations across very short stretches of water. Some ports in CAD have limited port land. Something must be done if ports are to earn enough money to benefit from larger ships, to help ports to afford deepening work. Many ports have lost their railway systems and even at Plymouth, as one of the major ports in CAD, its road transport is not a part of the UK strategic road network. Plymouth is penalised because it does not have motorway traffic, and this causes difficulty during the peak demands of traffic.

Environmental benefits

Focus group members agreed that water freight is a sustainable mode of transport. They emphasised the importance of sustainable shipping operations to keep our marine environment safe by using more available sustainable opportunities offered by waterborne transportation.

Participant 3: water freight can be it should be a sustainable green alternative so having said that once again you got to qualify that slightly we have destroyed our marine environment is only a green alternative if we carry out sustainable environmentally friendly shipping operations, but I think that is in heaven

Participant 2: But having said that the shipping industry is aware that the way that is taking activities in fact make sure that there are more sustainable opportunities.

Participant 3: Now I give you another example actually the numbers of road tankers which go every year from I believe it from Plymouth to sustain the fuel on the fishing boats in Brixham is very considerable and environmentally damageable, one coastal tanker going in periodically and putting into a tank which will then supply to the fishing vessels will cut off all of those road movements. So, we are not thinking small, we are not thinking big, as for as reasons which we have discussed, and we are not thinking small either.

The above example provided by one focus group member revealed that by using water freight a number of road movements can be saved and thus damage to the environment. Focus group discussion provided much more clarity on the environmental benefits of water freight and at the same time they expressed their

concern about exploiting more sustainable opportunities whilst planning shipping operations.

Market demand

During the focus group discussions market demand for water freight was an important topic to determine the feasibility of water transportation in the SW UK.

Participant 5: Now in a sense actually we got to do here is we got to find out what percentage of freight comes to the broadly speaking SW UK, that is Cornwall, Somerset, because there are two kinds of freight, liner freight and spot freight, things like shipments of fertilisers, timbers, coal all these kinds of coastal traffic in bulk and then the container traffic and the two are rather different because containers are consigned from a consignee to a recipient and it has goes from there to door to door. Also, in addition to that there are lot of containers to discharge on the continent we do not know how many that is. What we do now is lots of containers go to Ireland, and on the way to Ireland containers can stop at Falmouth or Plymouth, or wherever you like and drop containers off and on their way back pick containers. We have a good opportunity to focus on this sort of feeder service between Amsterdam, Rotterdam and within gulf coast.

Participant 3: I think there is a further complicating factor actually as far as SW is concerned. The prime driving source to our SW economy is micro business, and by their nature micro businesses do not control shipping movements. They don't have their expertise or the size of organizations to have their own shipping managers. So, if they are exporting they will almost all ways export on an ex-works or FOB basis, if they are importing they will almost always import on a CIF domicile basis, which means to say that in the SW UK very few are the people who are exporting or importing are actually controlling the movements of those boats.

Participant 2: Going back I think there are sorts of innovations taking place, I think in Plymouth for example there are some new developments in terms of cement storage on the power station works. That is going to generate shipping movements, it won't be that many nevertheless we should actually that is actually supplementing a cement storage facility on the other side so where is use there is demand in sufficient size in-fact opportunities are there, and I think that is the key to it. What is the demand I mean demand positioning within that D and C. The whole thing is commercialized isn't it yes, it is where there is an end customer.

Participant 4: The other thing which factor is actually the rubbish collection

Participant 1: More containers are coming up in SW not rubbish but recycling

The focus group discussion identified the importance of spotting market demand for water freight because locally very few people are engaged in exporting or importing of freight. Also, SW UK economy mainly depends on micro business. The shipping industry does not consider that micro business has the expertise or shipping managers to control shipping movements and exporting and importing takes place on a FOB and CIF basis. At the same time the flow of containers to

Ireland can be utilized as an opportunity to start a feeder service in the region where containers can drop at Plymouth or Falmouth. Innovations in the port such as infrastructure developments offer opportunity for more shipping movements. One example the focus group members stated is the development of a cement storage facility in Plymouth for the power station work which can generate better freight movements in the industry. Opportunities or demand for freight movements is the key to promote water freight. In this situation demand positioning requires special attention from the shipping and logistics industry in the SW UK.

Policy, support and promotion from the government, EU and DFT

The focus group participants discussed the policy, support in the form of tax incentives, subsidies and promotion offered by the government, DFT and EU to increase water freight movements in the SW UK.

Participant 2: There have been policies. Which Freight by Water I think was actually name of one of the policy organisation of the government try and promote short sea shipping and river shipping, that it is not been taken up very much, despite some of the interesting innovations like barging Congo sit down on the rivers.

Participant 3: Back in the 19th century there were consistently efforts and indeed acts of parliament created for a canal link across the south West and they did actually complete that just about by using the Bridge Water to Taunton canal and then the Grand Western canal which goes from through Wellington and joins up in Tiverton and they are actually relatively small and on to the river edge now. Tim Jones is Chairman of Devon & Cornwall Business Counties and a board member of the Heart of the South West Local Enterprise agrees that thing which gets government ministers exciting is big ideas, and he said what could we do for inland water ways, well actually really the only thing what we can look at it in South west would actually be because it is an interesting thought what would we do if we really did have a good access, I mean leisure boating, it will be quite important and no question about that could that be used that we know it is little bit of an outboard one but don't totally ignore it. I mean the cost will be considerable. should be the complications of the concerns of land ownership all sorts of things, roads and what have you, but the big gestures sometimes is what get politicians excited, so I just throw that in bit of an intention

Participant 4: I think there should be a campaign to join The Wash to the Severn and it is only 38 kilometres of either this use or un-usable canal and then if they can do that, they can sail all the way through from Norway Canal to Bristol Channel. You can do it now, but it is the huge deviation around, it takes a week or something to go around, so it is sort of time pressurize.

Participant 3: We detected there is a little bit more than an open attitude towards that these days and there has been for some while I don't know that would be my impression that there is from the government.

Participant 2: Well, I think most certainly the government is listening necessarily to anything to do with maritime activities.

The most important information collected from the focus group concerns government interest in maritime issues and problems. Even if government is listening to the maritime industry the battle may not be won. According to focus group members in the nineteenth century there was more support and efforts from government to promote water freight. 'Freight by Water' is the policy maker of the government for supporting SSS and river shipping in the UK. Its functioning was not sufficient to develop water freight in the region. Politicians are attracted to big ideas for developing water freight, but the cost of doing it, the concerns of land ownership all sorts of things, and roads we have, increase complications. An idea to start a campaign to join The Wash to the River Severn would definitely support and promote the growth of water freight. This offers an easy route from Norway Canal to Bristol Channel and all related benefits to the industry.

Professionals in the industry

The role of professionals in shipping and logistics in promoting water freight in the SW UK was analysed.

Participant 3: Ian Harrison who is the transport planning officer for Devon for many years, high respected by his own admission knows nothing about maritime, but he is a good chap and he is prepared to listen, so I think where we got good people who are prepared to listen that is already an advantage and I think to some extend we also got, we also suffer from local authority inertia as well.

Participant 5: I think that hits the nail on the spot. Local ports, sort of trying to develop their own things, hell lot of energy and possibly money is going into but it all at the local level

Participant 2: But they do coordinate there is a SW port group produced a new brochure have not they upon the need for the SW ports and couple of them with me. So, they are aware of what is going on, they compete with each other (Peter: yes absolutely) but of course Teignmouth is a part of ABP group, ABP of course got Plymouth sort of Mill Bay and of course they are actually also run from Southampton.

Participant 4: The ABP group is quite a significant group. I am sure they are all looking for opportunities and they only act when in fact an opportunity actually will see a positive return on the bottom line (Ian: absolutely) only hesitation is cruise shipping.

According to focus group participants, there are officials in different organizations related to transport (for example, transport planning) ready to listen industry's

problems. Professionals in shipping and logistics industry are trying to find opportunities where they can reap profit from their maritime activities. The SW UK port group consisted of all ports in the region, but their efforts are not sufficient to meet the needs of the industry. Also, ports in the region compete with each other for more business and have developed an attitude of competition amongst themselves. Professionals are motivated towards making benefits out of their business. Thus, they are developing their own local port's facilities by spending large amounts of money and energy in it. The focus group discussion also revealed that ports management spend their money only when they are confident on the return from it. As a result, ports with limited opportunities for wider shipping operations get neglected from the respective authorities easily.

Weather and tidal constraints

The focus group started with a discussion about the two main constraints that the SW UK is facing in its shipping activities such as weather and tidal constraints.

Participant 3: There are one or two limiting factors more or less we have lots of small ports which have in tight relatively limited depths of water for ships. If you go on north side into North Devon for example you also have limitations in terms of tidal access, because you got a very high rise and fall of tide that is not necessarily a limiting factor and we know that if you look at South Wales ports for example. But you do have to accommodate the rise and fall of tides.

Participant 4: What they want to do is they want to build the part of the harbour out in to the estuary, so they have the all tide access ports.

All participants agreed that weather and tidal constraints affect the developments of water freight in the region. North Devon ports are facing more access problems due to high rise and fall of tide and many ports have limited water depth to receive ships. The example of South Wales ports mechanisms in accommodating rise and fall of tide and building part of the harbour out into the estuary are options to overcome weather and tidal constraints.

Local authority

The focus group identified the role of local authorities in developing water freight in the SW UK.

Participant 3: I think if you deal with local authorities for example I suppose to perhaps centralised government I mean I suspect the performance in this respect of the local authority will be enormously patchy (Ian: As it is with the left as well) yes (Ian: not on toes) no no you get no arguments from me no definitely and their understanding of maritime issues is patchy as well and I think to some extend we also got, we also suffer from local authority inertia as well.

Participant 2: What you are saying really is no grant sort of schemes from the central government, it is actually put out to the local authorities the LEPs device that system within their own remake to make more efficient than their system.

Participant 1: We have not got people within those authorities in local agencies but actually have an understanding of maritime (Chris: and you are not going to get anywhere) you are not going to get anywhere, because they cannot formulate the policies as they are not aware of it.

Participant 5: Good, given the state of funding so on through local authorities if it is not a priority now it is not going to be.

Focus group members realized that local authority plans to develop water freight in the region are insufficient to achieve success. The basic problem is, the local governing bodies do not have people with maritime background to make necessary actions to support the industry in the form of subsidies, policies and tax reductions. The importance of local authority in promoting maritime activities has increased due to the central government grant distribution through such bodies. It is vital that professionals from shipping and logistics industry become members of local governing bodies to take proper action in favour of the industry and maintain an efficient grant distribution.

Economic benefits

Water freight can attract customers only when it has better economic feasibility compared to other modes of transportation. The focus group discussion identified how water freight offers economic benefits to its users.

Participant 1: I think answer is that certainly in that case when you can drive a container from far east UK today 500 dollars a box actually cost you that. In fact, Bristol to Felixstowe though actually some idea though efficiency per mil cost (that is right) cost per mile it is really negligible

Participant 2: one of the thing I found out fascinating is once upon a time we used to talk about the sorts of barriers to trade was transport cost, we do not talk about that any more. Because the cost has come down to such a level in fact it has no value.

Participant 3: It is in mini school. For example, 14 pairs of shoes from India is about a penny because the costs are in the transport side. thousands of pairs of shoes come in containers even motorbikes but actually new skill but if you are not containerised if you are messing around then

actually if you are sorting stuff handling it by hand or by forklift, or by crane then off course cost will go down straight away.

Participant 4: I got a pretty good example here of where we need to innovate to be able to handle cargo efficiently by water and in-fact if we invent we can do that so that it is cost effective who will be able to send so many places in the world that would be very useful.

Participant 5: if we are going to have a viable means on marine side it got to compete in cost terms and I believe therefore the issue, you are quite right I mean one of the big advantage is we have coastal operation.

The economics benefits of water freight were discussed. The invention of containers reduced the transport cost of water transportation. Worldwide cargo transportation became more economical and efficient. Sufficient cargo handling machineries such as forklift, gantry crane etc. could further cut water freight costs. Modern technological advancement in the shipping and logistics industrial activities enable water freight to compete in terms of cost and economic benefits.

Overland congestion

Water freight can reduce overland road congestion if suitable cargos can be shipped using water freight.

Participant 2: I think one of the issue they must be thinking of, must aware of some sort of the vehicles, problems, and traffic jams as such in the London area and if you think there what they are doing for example get rid of the waste material from that the new rail system they got in, the new sewage system and they are negating in fact the road traffic transport movements and the chap called Clive Castle is been involved and he is a Cornish man and he is a sort of involved with the development of the system(Peter: Which I work) and so the businesses using the sea and using the rivers is something which is sort of the developed tends not to be seen. But there is no one.

Participant 3: but more so than I than my experience for the last generation

Participant 2: I think there is a congestion cost this is what is doing it and if you can reduce that congestion cost I mean that we are talking about that waste material I mean we got the quarry waste sort of disclose the situation again other channels using water system right from city centre is really cost, the sort of things we do so I think there is and are opportunities which is yet to be discovered.

Using sea and river shipping waste materials management is possible, as in London. As a metropolitan city London, congestion is a serious issue on its roads. They use the Thames to transport their waste materials within the city to the recycling or refuse centres. As per the focus group participants' opinion water

freight is really useful to remove waste materials from the city centre since it does not cause any traffic jams or road congestion.

Attitude towards water freight

The development of water freight in the SW UK depends upon the attitude of its potential customers.

Participant 3: we in the UK I think also fall into that fact we think we are a maritime nation therefore we know about ships therefore we are a maritime nation and we don't have to prove it in any way (We don't have ships) yes, we don't have ships. And I think one of the problems is we are resting on past glory. Without realising we have done nothing to justify any longer this idea that we are a genuine maritime nation.

Participant 2: Northern Ireland has a port where they have container services and they have bulk services, they have coal, cement, timber and all sort of stuff going in there and they are reasonably busy port. So theoretically we should be able to support a port something like that scale, but I do not think we can support lots of little ports because simply it cannot gear up to the number of standard carriers, cranes, berths and turret.

Participant 3: Do you feel, I mean I have had deals with ABP in South Wales and some good people I suspect that large organizations and ABP is a large organization tend to suffer a little bit from same sort of inertia at times and stereo type thinking that local authorities incline to it, so something which affecting big organizations where the most dangerous things you can do in the courier path is to make a decision.

Participant 2: It is interesting when we compare Bristol, Bristol is an entrepreneurial port which is in fact lean and thin, and is able to be flexible in out moors with in fact organization like ABP which is large extensive but ok you sometimes get a feeling absolutely right and say that it lacks that sort of lenient and that ability to take advantage of opportunities unless they go right to the top and come back again

As a maritime nation UK has its own history and professionals but past glory does nothing to improve present conditions. Finance is lacking to support the infrastructure required to develop ports and shipping activities. ABP is a large shipping organization which owns 23 UK ports and is ready to spend money on improving port facilities. Even ABP faces difficulties dealing with local authority's due to inherited inertia and stereotypical thinking about shipping activities. In this situation, large organizations may discard development plans in preference of other ports where local supports are easily available. Local authorities' attitude towards water freight sometimes causes more problems to small and medium port

management groups business plans because they lack important contacts in government and the DFT.

Summary

The most important topic discussed in the focus group was the results of the Delphi study. All Delphi findings were clarified. The SW UK shipping and logistics industry faces many problems such as insufficient port infrastructure and hinterland connectivity, lack of policy, support and promotion from the government, DFT and EU, low market demand, attitude of local authorities and professionals in the industry, and weather and tidal constraints. The focus group were optimistic about the future of water freight because of government interest in maritime activities. There are officials ready to hear and work with the industry, but local authorities' attitudes still need to improve to consider maritime issues. The environmental and economic benefits of water freight have enhanced its importance recently.

Solutions to develop water freight were discussed including cheaper gantry cranes for handling cargos, construction of harbours into estuaries, identifying ports where berths can be deepened and expanded berths, and where cranes would supplement infrastructure. Most importantly identification of demand for water freight in the region requires special attention. Port management groups are ready to spend money on port infrastructure only when they are sure about its return. Demand positioning helps them to prepare themselves to do business efficiently. The government FFGs for supporting water freight are insufficient and DFT must of encouragement in the form of tax reductions, incentives, and subsidies. The role of water transportation in reducing land congestion and generating environmental and economic benefits to society and its customers should be regarded as important.

The appointment of professionals from the shipping and logistics industry into the local governing bodies is important in familiarising freight committees in councils with the real industrial circumstances and prioritizing issues. Professionals can

induce in local authorities' attitudes towards water freight and the distribution of grants and the industry can expect better policies, support and promotional activities from local governing bodies.

7.1.2 Recommendations to promote water transportation

After discussing the Delphi results, the focus group considered 'suggestions for the development of water freight in the SW UK'.

Participant 2: You could start an Inland Container Depot (ICD) at somewhere like Teignmouth or Exeter and not rely on starting with ships to get your containers running (Chris: Or combinations of bringing feeder ships if you've got enough. Otherwise stick it on road.) As soon as you have enough, and you have access to empty containers, small containers, you need to ship to Australia Rotterdam or US bringing back empty containers. The prize would be changing gravity somewhere down here. In the Exeter area an ICD would probably be viable and possibly if it became big enough you can speak to ABP about expanding Teignmouth. I mean afterwards we are over there, commercial proposal, they will back it up, and build a new berth quicker than Ireland.

Participant 3: In the SW our companies are very small and as a result a competitive disadvantage because of our combination of size and location we can only export through grouping services because most of these small companies cannot fill 20foot containers.

Participant 5: There are lot of containers to discharge on the continent - we do not know how many. What we do now is lots of containers go to Ireland, and on the way to Ireland containers can stop at Falmouth or Plymouth, or wherever you like and drop containers off and on their way back pick containers. We have a good opportunity to focus on this sort of feeder service between Amsterdam, Rotterdam and within gulf coast.

Participant 2: I think the option for feeder traffic for feeder-based ports within the SW can make use of truck traders which are already in place trading constantly with Ireland generating new traffic from feeder ships which in part result from the massive growth of ship size.

Participant 4: If you had a bright idea you could go to ABP and say I want to make some kind of partnership expanding these sort of small container feeder-ports because if we kicked off then you could play a sort of centre of gravity then it would develop Teignmouth which is just off the motorway and not far from anywhere

Summary

Suggestions for the development of waterborne transportation in the region mimic the Delphi results including: better port infrastructure and hinterland connectivity, facilitation of small scale water transport, establishment of feeder service and demand positioning within CAD. Other proposals suggested that local ports should have the ability to handle large freight. For this, ports should be prepared

with sufficient depth, berths, cranes, new handling equipment like gantry and better hinterland connectivity. The low population density in the region does not encourage large scale operations. The grouping service is a solution to overcome disadvantages like small size of the companies and small quantities to export. This helps companies to share 20foot or 40foot containers to export or import cargoes more economically. The industry needs to think small again in terms of small ports. Holland's example of using small ships for cement carriages could be emulated by small ports and harbours in the SW UK. An idea to design small ships was also discussed in the focus group, with on board gear and a size for four containers, which could save expensive infrastructure at the ports for container discharge. Other options for improved small scale water freight movements involve using barge carriers as a mini version of LASH (Lighter Aboard Ship) which assist discharge of barges going to different destinations.

Container ships are becoming ever-larger, generating increasing demand for feeder services. A feeder service between Amsterdam, Rotterdam and the Gulf coast could contribute towards better water freight movements. A port between Torquay and Brixham with container services, bulk services and its own hinterland is vital, because ship owners have low interest in going to Bristol port due to high costs of the voyage and the time required. A major port in the South West could encourage water freight regionally. The focus group suggested one option to develop a small regional container port as a joint venture with different big ports groups such as ABP. Big ports groups spend their capital only when they are certain of return or profit, and investment would bring regional benefits and managing the port's feeder traffic could rationalise reduce road movements.

The plan for feeder services implies an ICD which could increase the opportunities for water transportation. According to participants 50 containers a week destined for CAD would be a good start for feeder traffic. To make this materialize requires identification of ports which can be invested in, deepening and expanding berths, cranes and the infrastructure required to sell them. Innovative new equipment, such as gantry cranes are required for low-cost handling alongside an efficient

way of distributing cargoes. Once the requirements for feeder traffic are achieved, vessels heading to Ireland can drop containers destined for CAD at Plymouth or Falmouth or other SW ports and pick up containers on the backhaul. The implementation of these proposals requires ample cooperation and financial support from both parties such as the government and private ports groups. Also, research into present and future demand for water freight is a prerequisite.

Demand for water freight must be identified to make use of water freight opportunities in the region. Demand positioning is not an easy task. Customs records is one option to search for the percentage of freight that comes to the South West. Availability of such data can provide information about the main road traffic for top industries in the region and opportunities for water freight with current and future better infrastructure. Aside from these proposals, the focus group suggested various activities in and around ports to increase water transportation. One Interreg energy programme involves a circular power production cycle within ports that provides a unique opportunity to develop marine energy platforms in ports and create better opportunities for water freight in port regions. The idea of transfer of transport of waste for waste-to-energy products using water freight can create more opportunities for water transportation. Containers can be used for collecting rubbish from the farmers in Torquay and Torbay and sending it for recycling. Being a part of such programmes will help water freight to grow in the future. Whatever challenges water freight is facing now, the focus group collectively admitted that there has been quite a lot of work done to develop it. A re-evaluation of the small and simple can bring water freight back to transport.

7.1.3 Policies for water freight

Participants proposed suggestions for policy formulation to promote water freight in the SW UK.

Participant 2: Regarding policy formulation for the development of water freight, a lot of work has been done, so does it need to be re-integrated or reconsidered?

Participant 3: We detected there is a little bit more than an open attitude towards that these days and there has been for some while from the government.

Participant 5: Good. Given the state of funding and so on through local authorities if it's not a priority now it's not going to be.

Participant 1: We have not got people within those authorities in local agencies who understand maritime (Chris: and you are not going to get them anywhere). They cannot formulate the policies as they are not aware of them.

Summary

Participants were aware that government has introduced policies for the promotion of water freight, but they demand a conscious effort from the respective authorities to reintegrate or reconsider those policies based on the current scenario. Government interest in maritime activities and progress in making policies are positive signs and professionals in the industry have an important role in contributing to governing bodies to influence policies to promote water transportation. Government policies are required to l create interest among potential customers and require support in the form of grant, subsidies and tax reductions. State funding for maritime activities is handled by the local governing bodies but is insufficient. Local authorities underplay policies and promotional activities for water freight because they are unconvinced about its potential ports in the region must cooperate to lobby jointly for better policies and financial incentives. The South West port group has an important role to co-ordinate every port in the region and motivate them to focus on the promotion of water transportation as a common goal.

7.1.4 Issues in policy formation and implementation for the development of water freight

Discussions revealed various barriers at central, regional and local government level towards forming and implementing policies to promote water freight.

Participant 3: We think the barrier to policy formulation at central government level has probably been resolved to quite a large extent. But the barrier to policy implementation comes from lack of understanding of the sector I suspect at regional level (Peter: Lack of entrepreneurs as well)

indeed in the centre, perhaps because once again the sector is largely controlled by the bigger bodies like ABP and these organizations are getting bigger and bigger.

Participant 5: There is a question about commercial knowledge, about exactly how much money comes from the freight that could be generated; that is the difficult thing to get that.

Participant 4: That is true and essential if you are going to work out where it is worth investing in those projects

Participant 2: The planning issues could be in fact a barrier to policy implementation

Summary

Participants agreed that central government barriers to policy formulation have reduced as government is now listening concerning maritime issues. At the regional level the sector is misunderstood, particularly its regional economic impacts. Absence of industry professionals in the governing bodies hampers policy formulation and implementation No initiatives for entrepreneurial activities from potential users have emerged because new entrepreneurs are deterred by a lack of attractive policies and financial support. The industry is largely controlled by large bodies like ABP, which discourages entrepreneur start-ups. The industry should be approachable to small and medium entrepreneurs too. The government and the DFT have the responsibility to protect potential entrepreneurs' interests by forming attractive policies and packages to start their venture. Other reasons for limited entrepreneurial activities are the lack of availability of regional data about how much money comes from the freight that could be generated and commercial knowledge about the business. To make policies suited to current conditions requires current commercial knowledge. Gathering regional data is difficult which hampers planning, policy formulation and automatically create barriers to policy implementation. The implementation of policies for promoting water freight in the region is usually affected by the cost and the difficulties in getting through all these issues.

Another barrier to policy formulation and implementation is the environmental audit. The environmental lobbies act based on local prejudices rather than on a global view. Their activities delayed plans for maritime activities and reduce opportunities offered by that plan. The environmental agencies should act more

practically and quickly for the implementation of whatever plans are formulated in the maritime industry to reach the market place without any delay. All the listed issues and problems to form policies for better water freight and its proper implementation require a strong lobby for water freight in the region. An awareness movement is necessary to spread the benefits of water freight which may result in the formation of a lobby working for better water freight in the region.

7.1.5 Further research topics for promoting water freight in the region

The focus group made many recommendations for the promotion of water freight in the region and highlighted some issues to explore which would assist successful implementation.

Participant 4: We need to know the cost. Shipping cost, worldwide cargo in containers to places in CAD. And the other-way around

Participant 3: And how many people are actually shipping in and out, not just on full loads but in general.

Participant 5: The cost in just a competitive strategy. There is being in sea freight or inland freight - they may even lose money on one element and make money on another one, because they are quoting 1500 dollars and you don't know how much is the inland, how much is transport, how much is the handling cost, how much is profit or you don't know what the profit is. It is very difficult.

Participant 4: Re innovation. We can get figures and challenge it and that is what we are doing. We can make a prediction of how the cost of road transport is going to increase. It has been increasing for 20 or 30 years and is going to get worse. These are the figures that they are within the government… they know that using water freight is a very good thing.

Participant 2: …the investigation has two areas. Individual bespoke opportunities, opportunities such as the inter- point business and opportunities through the feeder traffic, trying to assess the needs for it, where we go to get it…

Summary

Water freight in the region can perform better if information is made available to potential users concerning shipping cost, worldwide cargo in containers to places in CAD and containers to export from CAD, a general idea about the number of exporters and importers in the region and feeder traffic opportunities. An idea about the shipping cost such as the booking cost, container cost, inland cost,

transportation cost, handling cost and the profit out of it is vital data for customers. The potential for water freight can be realized based on the general demand for water freight in the region but such data is not readily available. Participants strongly advocated research to find out such information to support policies and promotional activities.

The group highlighted escalating road transport costs in recent decades, which are well-known to government. A study on the comparative costs of transportation for road and water is essential to create awareness about water transportation as a sustainable mode of transportation, that offers low cost journeys, and which contributes to corporate sustainability strategy.

In their final conclusion, participants expected a bright future for SW UK water freight. As members of the Maritime and Waterborne Innovation Group participants noted that the British government had become t more positive towards maritime infrastructure. By 2050 there will be a much more realistic view of transporters, developments in maritime opportunities, deep sea container services, feeder opportunities, and a potential container terminal in Plymouth.

7.2 An evaluation of the focus group discussion

The focus group offered a detailed analysis of the Delphi results and gave clear guidelines for making water freight a popular mode of transportation locally. Their decades of experiences, and knowledge in the maritime industry reinforced their discussions on each topic. They confirmed that the findings of the Delphi study are transferable elsewhere in the UK especially where there are regional hiccups, restrictions and complicated issues regarding the maritime policy framework. The focus group contributed to the research with suggestions for a new port in SW UK, construction of an inland container depot, a campaign to join The Wash to the River Severn, participation in the Interreg energy programme, the importance of maritime people in local authorities, availability of regional shipping data, need

for more entrepreneurs in the industry, quick and genuine environmental audit, and a study on the feeder traffic opportunities.

However, some interruptions occurred before, during and after the focus group. The researcher did not have prior experience of conducting a focus group which resulted in some confusion while organising the group. Scheduling the availability of five members on a predetermined date was challenging but participants' interest in the research topic brought them together to share and contribute to the discussion. In the event, participants did not discuss irrelevant topics, which nullified the researcher's anxiety to avoid this situation, given participants' experience and knowledge. The location for the focus group discussion was selected as convenient for participants but noise and other distractions affected the quality of the recordings, making transcription time-consuming.

This study offers many findings to promote water freight in the SW UK. The expert panel was comprised of prominent professionals and their contribution is sufficient to potentially change the present status of water freight regionally. Water freight is an important solution to promote sustainability in freight transportation and promotion of it begins with awareness of the benefits Government and the DFT must focus their attention to create awareness programmes for water freight and disseminate data to professionals and the general public, prior to accepting and implementing all the suggestions and recommendations listed in the study to promote water freight in the region.

Chapter 8 Discussion and Conclusion

The research was conducted to discover the possibilities for water freight in CAD. Even though water transportation is not a new concept in the region, the usage of it decreases every year (DFT, 2013). CAD has a long history of water transportation. As stated in the beginning of the literature review developments in road and rail transport are more suitable for the region in meeting its demand. Consequently, the importance of water transportation has reduced. At present the public is more conscious about health concerns and factors that positively and negatively affect well-being and living standards. This results in creating awareness about the benefits of water freight among the public which is presented with more chances to see very good examples of successful stories of using water transport for the movement of goods. Also, the government is encouraging the usage of water freight as much as possible to reduce the dependence on road freight in moving goods.

In this situation, this study examined the possibilities for water freight in CAD to support an increase in the usage of water transportation in the region. Formation of a conceptual model based the objectives of the research and literature review on the subject area helped to choose the most appropriate methodology for the research. As a result, three rounds of the Delphi surveys were conducted to collect primary data. A focus group with the experts from the maritime industry in the SW UK on the results of the Delphi study confirmed the trustworthiness of the Delphi findings.

8.1 Research objectives

The main research objectives of this study displayed in chapter 1 are as follows.

1 To examine the nature of water freight in the SW UK, especially in CAD

2 To evaluate the contributions, that water freight could make to the logistics industry in SW UK

3 To synthesise the challenges blocking potential logistics companies in using water freight as their modes of transportation

4 To assess the socio-economic impact of water freight

5 From the above objectives to evaluate the managerial solutions in developing water freight as an efficient and sustainable mode of transport in the SW UK

The Delphi study resulted in a total of eight consensuses (at 75% or above) from the different issues raised in Delphi surveys. Another six statements had achieved agreements among the expert panel members close to 70 -74%.

The expert panel members' genuine interest in the development of water freight as a sustainable mode of transport motivated them to contribute their best knowledge and experiences to the Delphi study. They discussed every statement in the Delphi survey using all possible dimensions to contribute to the study effectively. As a result, the Delphi study presented a real picture of water transportation in CAD with its pros and cons. The consensuses revealed the nature of water freight in CAD, different contributions water transport can offer to the logistics industry, the main challenges blocking the utilization of water transport in the region, the socio-economic impact of water freight in society and many managerial solutions to improve the status of water transport in CAD. The results of the Delphi study could assist the concerned authorities to take necessary actions for making improvements in water transportation in the region.

8.1.1 Research objective 1: To examine the nature of water freight in the SW UK, especially in CAD

The Delphi surveys together brought a large amount of information on water freight in the SW UK especially in CAD. The Delphi results cover every aspect of water transportation in CAD. The researcher has identified the importance of achieved consensuses in the Delphi study for making better water transportation in the region. These consensuses can play vital supportive roles for promoting water freight among the stakeholders. According to the consensuses the

geography of CAD is ideal for water transportation. The presence of an extensive coast line and accessibility to several ports along the length of the SW UK strengthen the consensus formed among the expert panel members. The region has potential for conducting coastal and short sea shipping, transportation of non-time critical low value high volume freight and small loads to small ports on general or small cargo ships. Small and medium sized ports in the region can be used for small quantities of single bulk cargo movements.

The focus group presented more details about the nature of water freight in the region. According to the focus group participants, currently ports in the region do not have sufficient infrastructure facilities and hinterland connectivity to function successfully. Ports have limited tidal access and inadequate depth of water restricts ships' access into the ports. The competition from road and rail networks in terms of cost is greatly affecting the feasibility of using water freight in the region. In CAD mostly small sized companies' export and import small quantities for their business. Microbusiness firms in the region do not have sufficient expertise and human resources to manage their shipping requirements. Large organizations could have made investments in the small ports in CAD if the local authorities are ready to welcome their proposals without any inertia about these organisations' investments plans.

There are many favourable factors to support water freight in the region such as availability of basic port facilities every 20 miles, presence of an extensive coastline and strategically spaced natural harbours. As per the focus group discussion, to develop water freight in the SW UK a port with container services, bulk services and own hinterland is an essential requirement. Both the Delphi participants and focus group members jointly confirmed that if there is an effort from the Government and port authorities to study the requirements needed for better water transportation in the SW UK and activity-oriented planning with estimated infrastructure developments, and funding requirements, this helps to develop water freight and make it more attractive to potential users.

8.1.2 Research objective 2: To evaluate the contributions, that water freight could make to the logistics industry in the SW UK

A very detailed analysis of the contributions water freight could offer to the logistics industry was addressed in chapter 6. Also, these findings of the Delphi study were agreed by the focus group members. The main findings of the Delphi study explained that as a mode of transportation water freight can reduce the cost of transportation significantly for the transportation of bulk products long distance compared to road, and water transportation is an effective way to reduce the negative impacts on the environment and external costs compared with road transportation. This increases its sustainability. It is shown in the Delphi study that water freight is a sustainable mode of transportation for the shipping and logistics industry. The transportation cost for long distance using water freight is low because of its high energy efficiency and the principle of economies of scale, such that when ship size increases the number of units it carries also increases, thus spreading the unit transportation costs over each unit that the ship carries. As a result, the cost of transportation becomes low compared to road and railway transport.

This is not the case with short and medium distance transportation cost for water freight. Due to insufficient infrastructure at the ports in CAD demands are high price for double handling. Poor hinterland connectivity to the major road and rail network also increases the cost of transportation for short and medium distance water freight. Since the ports in CAD are small and medium in size, most of the vessels that are used for water freight are comparatively small or medium in size. Its capacity to carry cargoes is also limited. There is a high cost for double handling and the last mile using trucks or trailers increases the unit cost of transportation of the cargoes in the ship. The important question here is who is going to pay the extra cost incurred for water transportation when road transport offers a much cheaper price for transportation.

To save high costs of transportation for short and medium distance water transportation in CAD requires development of proper vessels sized as per the general export and import demand for cargoes, small containers to ship small quantities, sufficient hinterland connectivity and modern technology oriented infrastructure in the ports. Also, these developments could help long distance water freight in the region to reduce the cost of transportation further down. Water freight is best suited to transport non-time critical bulk cargoes. Water transportation can be used for just in time and door to door delivery of time not critical cargoes. With the integration of local water freight into intermodal transportation, links between the existing port facilities, better hinterland connections, infrastructure and operational systems, the door to door delivery of goods could improve and be more reliable to conduct. Water freight in an intermodal transportation can be profitable to the entire logistics chain if the overall multimodal cost is lower than road transport and frequency and reliability of water transport are competitive. With improved port infrastructure, subsidies and investment for essential facilities and a reduction in duty/taxes, water freight in the region can support transfer of road freight movements to water.

The sustainability feature of water freight is an important quality which makes it more attractive to the industry and public. In the present situation the usage of water freight can be increased by creating awareness about the importance of sustainability among the professionals in the industry, government authorities and the public. The higher cost of transportation for water freight is less of a concern when there is awareness of sustainability and the contributions of water transportation to social wellbeing resulting from reduced emissions of CO2 and greenhouse gases, and lower cost arising from accidents, noise, congestion, climate change, and damages to nature and the landscape. For example, nowadays people are ready to pay a considerably higher price for organic products after realizing its importance to keep them healthy. Once society realizes the benefits of using water transportation, the cost of it cannot be a barrier to its increased usage. Most important is creation of awareness about the sustainability

contributions of water freight and proper development of sufficient infrastructure and hinterland connectivity at the ports to improve efficient and effective water freight movements in the region.

8.1.3 Research objective 3: To synthesise the challenges blocking potential logistics companies in using water freight as their modes of transportation

The Delphi study and the focus group discussion pointed out many challenges hindering potential logistics companies in using water freight as their modes of transportation. Major challenges revealed in the study are insufficient infrastructure at the ports, poor hinterland connectivity, lack of public investments, original thinking to handle small quantity of cargoes by water, public support, knowledge about water freight and attitudes towards water freight are the major barriers to increased utilization of water transport in CAD. Expensive multimodal infrastructure, shortage of specialists to assist companies to use water freight, reliability, speed and frequency of water freight services and over regulation of marine traffic limit the integration of it in the logistics chain. Besides all these challenges, the lack of enough population and sufficient demand for significant volumes of cargo cause under-utilization of water freight in CAD.

The focus group discussion helped to figure out more challenges. As per the focus group results no container facility in CAD, limited tidal access at the ports, limited depth for water for ships, competition in terms of cost from road and rail networks, presence of a strong road lobby, subsidy for roads, presence of small companies and their micro business, and very old railway system for hinterland connectivity are some of the challenges blocking potential logistics companies to use water freight.

This research identified challenges which prevent water freight from being a preferred mode of transportation in the industry. The Delphi study and focus group participants' experiences in the shipping and logistics industry enabled them to understand the real issues behind the development of water freight in the SW UK. Once the problems are identified it is much easier to prepare a workable plan to

solve any issues from its root causes. The above mentioned challenges require immediate action oriented planning to make water freight more attractive to its potential users. Each challenge itself reveals the complications associated with it and offers more options for selecting a better strategy after analysing each challenge in detail. The, professionals, cost, regulations, and the governing authorities have important roles to play in making these challenges into strengths of water freight. If the professionals in the industry and governing authorities from the local, regional, national level have a real interest in the promotion of water freight the other two factors such as cost, and regulations can be created out of their interest and attitude towards water freight.

8.1.4 Research objectives 4: To assess the socio-economic impact of water freight

The Delphi study and the focus group results agreed that water freight can lead to the economic growth and prosperity of a region in conjunction with a coordinated economic policy, and with the support of economic incentives. Improved water freight movements will reduce road congestion, increase port employment, and local jobs and local distribution opportunities which could be beneficial to the industry and society. The use of water freight can offer competitive cost for longer journeys and can integrate remote locations in the region. The geography of the region would support water freight for easy customer delivery, which is sustainable and safe. Water freight needs less energy, fuel and labour to operate compared to road transport. Consequently, the cost of transportation, external cost and amount of pollution are reduced. The use of water freight produces a better environment, congestion free roads, lower prices for goods, and a better economy.

Advantages of water freight are useful to society and economy. As stated earlier usage of water freight is limited in the SW UK. In order to enjoy benefits of water freight requires wide use of it in the region. An increased usage of water transportation is only possible when there is a supportive environment for its

smooth functioning. Based on the results of this study it is understood that the geography of the SW UK is ideal for waterborne transport and different challenges need to be resolved for better water freight movements. Once the respective authorities and officials are ready to listen and act as per the findings of this research the SW UK could enjoy benefits of water transportation like many other European countries. One of the most important challenges to make this materialize is the funds required for the infrastructure developments at the ports and hinterland connectivity. A comparative analysis of all the benefits of water freight offers for present and future generations and the cost of making better water transportation could give an answer to this issue.

At present society is not very much aware of the benefits of water transportation. People should be given a proper education about the advantages that water freight offers to their everyday life. As per the Delphi results the professionals from the industry are also not aware of it. An awareness programme for water transportation among the professionals in the industry and the general public would offer a joint action to promote water freight in society.

8.1.5 Research objective 5: From the above objectives evaluate the managerial solutions in developing water freight as an efficient and sustainable mode of transport in the SW UK

One of the important contributions of this research to the industry is the formation of practical solutions for various challenges water freight is facing which hamper growth in the SW UK. Three rounds of the Delphi surveys and the focus group discussion produced many suggestions to promote water freight in the SW UK especially in CAD. These managerial solutions were discussed in detail in the chapters 6 and 7. To overcome the numerous issues in operating water freight in CAD some important suggestions are; to create a collaborative partnership between all ports, integration with other regions, national and European level, provision for a feeder port, an inland container depot in the region, persuade international maritime regulators to instigate a new class of marine vessel

regulation for coastal/inland waters craft, a campaign to join The Wash to the River Severn, be a part of an INTER-REG programme and waste to energy product using water freight and start a conversation about the relative total costs/benefits of water vs road transport, and research to analyse the current level of road freight movements. Research on water freight's possibilities and new uses would be helpful to realize the potential in the region.

The current situation of water freight in CAD can only change when it gets assistance from the Government and DFT. The government and DFT have shared responsibility to provide substantial support and help to promote and develop water freight in CAD. Their support in the form of subsidy, incentives, tax reduction and improved publicity could encourage the stakeholders to use more and more water transportation. A wider strategic approach is needed to educate the professionals about the possibility of water freight, because without their support changes in transport modes is not happen. The expert panel members also demanded for government support, better infrastructure, and proper marketing of water freight for developing water transport in the region. Usually regulation is not a significant issue. A simple regulation would attract more potential business users. Standardisation of port entry requirements simplifies the entire process and would encourage more companies into water freight. A clear understanding of the legislation and measures provides better opportunity for commercial gain.

The expert panel members of the Delphi study and the focus group have given their best advices for the development of water freight in CAD. The major players to decide the future of water transportation in the region are the government, DFT and the professionals in the industry. All three of them must express their interest collectively for the promotion of water freight in CAD. If any of them is not ready to cooperate, it would not be a successful venture to work for improved water freight movements in the region.

8.2 Implications

This study contributes to theoretical development in logistics; professional practice in the shipping and logistics industry; and governance issues, through various theoretical, industrial and policy implications.

This study produced reliable knowledge on theoretical developments in logistics, professional practice in shipping and logistics, and governance. The theoretical and practical understanding of the industry's practices, the role of governing organizations and the theories formed during the study are fundamental to the development of water freight in the SW UK. A summary of the contribution to knowledge made by this research is presented below.

Theoretical developments in logistics

The findings of the research revealed the importance of sustainability in logistics operations. Many researches were conducted to promote and support the positive aspects of water transport in increasing the sustainability and reducing external costs (Digiesi et al, 2012; Winebrake et al, 2008; Sauri and Turro, 2013; Sambracos and Maniati, 2012; Eede, 2010; AASHTO, 2013; Bonnerjee et al, 2009; Carr, 2011). The cost of logistics, and external costs due to freight transport include costs of accidents, emissions and noise in addition to operation and maintenance of public infrastructure which are able to reduce these effects by developing more sustainable solutions such as water freight.

Intermodalism is the key to increase the efficiency and competitiveness of logistics industry while keeping an environmental balance. Effective intermodalism ensures the use of the most efficient mode of transportation and increases sustainability in operations. A comprehensive door to door logistics chain will provide efficient, regular and frequent services that can compete with existing road models and offer cost savings. The potential of water freight as a mode of transport and the benefits it offers to the industry and society are strong factors to become a part of the logistics chain. Major problems faced in the

integration of water freight in a logistics chain are the professionals' attitudes, unchanging mentality, resistance to accept changes and unwillingness to "make it happen".

The potential and profitability of intermodal shift depends upon the characteristics of the commodity, the location and destination of the commodity, the economic viability of moving by different modes of transportation, availability and type of transfer equipment, infrastructure, road and rail links. Two conditions are important for water freight to become a part of an intermodal transportation system. They are firstly, that the overall multimodal costs must be lower than road costs and secondly, frequency and reliability have to be competitive compared to other modes of transport. Proper infrastructure and operational systems could potentially make the water based intermodal chain more reliable for more practical uses. SW UK is largely accessible by waterways so just in time and door to door delivery of time non- sensitive goods would be possible.

The conceptual models in figure 8.1 and 8.2 can be used as a basis to structure research into water freight logistics. Even though these conceptual frameworks are focused on SW UK water freight, the literature review and the expert panel explained that many of the issues outlined in the conceptual framework are similar to different regions and countries. Influences of different factors on water freight may vary according to the geography, location, industry, economy, and society of that particular region or country.

Professional practice in shipping and logistics

As per the findings of this research the logisticians, freight forwarders and all professionals in the industry need more information about the benefits of water freight. Once they are fully informed and convinced themselves, they can then promote and create awareness among the stakeholders and provide better knowledge about the potential of water freight as a sustainable mode of transportation. At present due to the industry's reluctant and laboured communication with its stakeholders, these benefits are undersold to potential

users. Proper marketing of the benefits of water freight compared to other modes of transport and a strategic approach to educate professionals in the industry are prerequisites to increase the use of waterborne transport. DFT has a key role in promoting water freight. DFT can develop innovative ideas through funding mechanisms. An effective policy to overcome cost and significant investments requirements can only be achieved at government level. DFT has the responsibility to provide substantial support in the form of policies, grants, tax reductions, subsidies and incentives to promote and develop waterborne transportation in the country.

The potential for a modal shift to water freight varies for different product types and this needs to be incorporated into analysis and policy. At present with the available port infrastructure, hinterland connectivity, support and policies of the government and DFT, water freight is perceived as cost-effective only for transporting heavy bulk products over long distances. A detailed analysis of road freight movements will help to identify different suitable bulk products which can be shifted to water freight. Policies for financial support, encouraging firms to develop a department for promoting modal shift for sustainable freight transportation, etc are necessary to increase the usage of water freight.

Governance

Logistics sector professionals and company representatives should become part of the governance structures for water freight development. Their presence in the local and regional governing bodies is essential to formulate policies in favour of water freight, to familiarise freight committees with the real industrial circumstances and to prioritize issues. The appointment of specialist professionals will generate positive attitudes towards water freight among the authorities and thus industry can expect more targeted policies, support and promotional activities from governing bodies. Local authorities should play a key role in the allocation of grants related to water freight because all state funding for maritime activities is handled by them. In such situations the presence of

professionals from the shipping and logistics industry in the local governing bodies can help to organize an efficient and effective distribution of grants for the deserving users of it. Any financial support in the form of grants, subsidies or incentives could in turn attract more potential customers into water transportation.

More collaborative governance arrangements should be developed between constituent ports in the region. A collaborative partnership between all ports in the region will create more opportunities for better usage of water transportation by sharing information and infrastructure at the ports. The willingness to work together will enable greater utilization of the ports regardless of their size and capacity.

An in-depth discussion of theoretical, industrial and policy implications is presented below

8.2.1 Theoretical implications

This section analyses concepts and principles adopted to explain the research strategy used for collecting data and analysing data and any new understandings on existing theory that have emerged. According to Boss et al (1993, p. 20) “theorizing is the process of systematically formulating and organizing ideas to understand a particular phenomenon. Hence a theory is the set of interconnected ideas that emerge from this process”. As qualitative research, this study used an inductive approach to generate theory from data. An exploratory research design was adopted with an aim to use both secondary research and qualitative data collection methods for gathering data. Absence of previous academic studies on the area of research generated uncertainty about the precise nature of the problem. In this situation, the Delphi method was selected for data collection to achieve consensus in the area of uncertainty into a general agreement to fulfil the objectives of the study. The experts from the shipping, supply chain and logistics industry in the UK participated in the three rounds of the Delphi surveys. Their contributions to the study resulted in a total of eight consensuses on the research

topic. To confirm the rigour of the outcomes of the Delphi study a focus group with the members of the Maritime and Waterborne Innovation Group in the SW UK was conducted.

The Delphi study designed and conducted work to implement four key planning and execution activities including problem definition, panel selection, panel size and conducting the Delphi rounds. A detailed analysis of the Delphi procedure helped the study to identify that the problem for investigation is appropriate for the Delphi method, panel selection with most suitable expert members, panel size of 29 and three rounds of the Delphi surveys to achieve consensus on the topic of discussion. The panel was carefully selected according to a set of relevant criteria such as experts from the industry and organisations involved and representing water freight, knowledge on the topic and personal experiences in the shipping, logistics and supply chain management industry. Such a sample size has produced valuable data on the potential for water freight in the SW UK for better water freight movements in the region. Even though many users of the Delphi method reported that the findings of the Delphi study are reliable, valid and trustworthy for future application, this research has verified the Delphi results via the focus group. The general overview of the focus group on the results of the Delphi findings given below could provide a possible explanation to this emerging implication for theory i.e. the findings of the Delphi results would help for better waterborne transportation in the SW UK as well as similar places.

“This study we are talking about could apply almost to anywhere especially places where there are regional hiccups. In some areas, there are some complicated issues, if we can crack on here, then other areas of similar restrictions on marine frame could benefit from what we do”.

According to McMillan and Schumacher (2000) a theory can develop scientific knowledge by following a set of criteria. Firstly, it provides some explanation about the observed relations regarding their relation to a phenomenon; second it should be consistent with an already founded body of knowledge and observed relations;

third it provides a device for verification and revision, and finally it encourages further research in areas which require investigation. Based on the above-mentioned criteria, a detailed literature review on the topic of investigation in relation to different aspects of current waterborne transportation was depicted in chapter 2. The findings of the Delphi study reinforced the importance of water freight as a green sustainable mode of transportation and its socio-economic importance to society and the industry. The Delphi results also explained the supportive geography of CAD and limitations for better water freight movements in the region. Verification and revision of the Delphi results was done by conducting a focus group with the members of the Maritime and Waterborne Innovation Group in the SW UK. They agreed the findings of the Delphi study and added more information for betterment of water freight in the SW UK. Both the Delphi study and the focus group suggested areas which require further research for attracting potential users of water freight for an increased usage of it.

The adoption of qualitative research for research work occurs when an issue under study needs to be comprehended in a complex and detailed level (Tavallaei and Talib, 2010). In other words, the ultimate purpose of qualitative research methods is to glean a deeper understanding about a phenomenon or event in real life. Thus, this research has produced a very detailed assessment of the research topic ‘the potential for water freight in the SW UK’. The use of the Delphi method helped the study to provide an accurate understanding of the research problem by combining the knowledge, skills and experiences of a group of experts. There was an opportunity for all expert panel members to record their opinion for every statement used in the questionnaire, which motivated independent thoughts and gradual formation of group solutions in the Delphi study. The procedures of the Delphi study supported for a detailed analysis of the research problem and thus achieved a real picture of potential for waterborne transportation in CAD.

The literature review on the research topic revealed that there is limited water transportation in CAD. The Delphi results revealed that the presence of extensive coastline and accessibility to a number of ports along the length of the SW UK

coast are supportive for water freight movements in the region. With improved port infrastructure, subsidies and investments for making essential facilities, hinterland connectivity water freight in the SW UK can support transfer of road freight movements to water. These results are important for creating a new awareness about the potential of water freight among the professionals in the industry which can be a very good reason to promote water freight. Consequently, it brings many positive changes to the country such as sustainability, reduction in overland congestion, competitive cost, integration across all regions and economic progress.

The results of the Delphi study are answers to many questions about the usage of water freight in CAD. According to Bloor (1997) a focus group at the end of the study with the purpose of allowing participants to comment on initial analysis, minimises interviewer bias. The focus group validation of the Delphi results also confirmed that water transportation in the region can be done better with support from local authorities. Important suggestions for the development of water transportation in the SW UK, including policy formulation, barriers to policy formulation and issues which require further investigation for the development of water freight, were discussed in the focus group. It was an advantage for this study to conduct a focus group with a group of similar interested members working for the development of water freight in the SW UK. Their contributions demanded many changes in the existing attitudes towards water freight such as small ports for small scale shipment, designing small ships, small container feeder port, an inland container depot, etc. for making water freight movements attractive to the industry and stakeholders. If the government and the industry are ready to listen to the results of this study, it could transform the role of water transportation into an active partner of the logistics chain.

A campaign to join the Wash to the River Severn, to transfer waste for waste to energy product using water freight, an INTER-REG programme, presence of people who are aware of the maritime issues in the government organisations, availability of regional shipping data, quick and genuine environmental audit etc.

are some of the implications that have emerged from the focus group. These suggestions demand a change in the way of approaching water transportation in the SW UK. The focus group discussion clearly stated that to promote water freight in the region, existing concepts and mechanisms in the water transportation industry should be updated. This study is contributing to the present water transportation philosophies a complete makeover to adopt new suggestions, policies and recommendations for becoming an attractive industry to the shipping and logistics industry. The participation of the experts from the shipping and logistics industry in the Delphi surveys and focus group discussion jointly admitted the importance of a new framework for water freight in the South West region to survive many more years as an efficient and effective mode of transportation in the logistics chain.

Theory is a unique way in which reality can be perceived, expressing someone's prominent insight about an aspect of nature in addition to offering a fresh and new understanding about a world aspect (Silver, 1983). The Delphi results and focus group findings are giving new insights on water transportation in the SW UK to the industry and whoever is related to it, such as the government, DFT and the public in general. The outcomes of the Delphi study and focus group discussion firmly confirmed that waterborne transportation is suitable to the SW UK coast and it can offer many benefits to the industry in the form of sustainability, reduction in overland congestion, competitive cost, integration across all region and economic progress. Other major contributions of this study are the formation of many important suggestions and policies to develop water freight in the region, factors need attention while forming policies and its implementation and finally issues which require further investigation for successful water freight movements in the SW UK. As per the available statistics, water freight movements in the region do not show any considerable improvements in the recent years. In this situation experts participated in the Delphi study and focus group claimed that the results of the study framed from their knowledge and experiences can contribute to better water transportation in CAD.

The Delphi method and the focus group helped this research to achieve deeper understanding on the potential for water freight in the SW UK. The five objectives of the research have contributed better awareness of the nature of water freight in CAD, contributions that water freight could make to the logistics industry, challenges blocking the use of water transportation, the socio-economic impact of water freight and many important managerial solutions to develop water freight as an efficient and sustainable mode of transport in the SW UK. These insights have important implications for policy formation for the promotion of water freight in the SW UK. More practically appropriate policies for the region can be formed from the findings of the research. Issues behind the poor performance of water freight were identified and the suggestions formed in the study would be sufficient for rectify those issues. The results of the study provide the latest information from the industry when making decisions for successful water transportation.

8.2.2 Implications for industry

The shipping, logistics and supply chain industry have a great role in deciding the future of water freight in the SW UK. The findings of the Delphi study and focus group have various industrial implications for practitioners in the maritime industry. The logisticians, freight forwarders and Department for Transport could adopt the results of this study when they implement policies for the development of water freight in the region. The Delphi study and the focus group clearly pointed out a number of possible ways the industry can promote water freight in the region. The suggestions formed during the Delphi study and focus group for the promotion of water freight and policy formulation, barriers to policy formulation and implementation and identification of issues require further investigation offered large amount of information for the industry to use for the development of water freight in the SW UK.

The most important implication for the industry is the consensus formed on the suitability of water freight to the SW UK and factors behind the poor performance of it in the region. Information collected during the Delphi study and focus group

discussion would be sufficient for the industry to change their attitude towards water freight and to form action plans to overcome difficulties for a smooth and successful running of water freight in the region. The qualities and advantages of water freight are also confirmed in the study. This study helps anyone from the industry to update their knowledge about water transportation and become self-motivated for the betterment of water freight in the SW UK. The participants in the Delphi study and focus group were from the shipping, logistics and supply chain industry and revealed the true picture of water transportation in the SW UK. Their knowledge, experiences, wishes, concerns on the research topic shared in the form of suggestions for the promotion of water freight and policy formulation, barriers to policy formulation and implementation and identification of issues require further investigation, provide a new opportunity for the industry to rethink about the role of water freight in the logistics chain.

Overall, 68.18% of the Delphi participants agreed that with improved port infrastructure, subsidies and investments for making essential facilities, water freight in the SW UK can support transfer of road freight movements to water. Also 72.73% of them confirmed the economic benefits of water freight to the economy of CAD if it is offered as an alternative to road transport with sufficient port infrastructure and hinterland connectivity. To make improvements in the poor performance of water freight in the region needs special attention from the industry. The expert panel members of the Delphi study formed three consensuses to explain the role of the industry in promoting water freight in the SW UK. As per the consensuses logistics professionals and freight forwarders need more information about the potential for water freight in CAD (73.91%). Logisticians, freight forwarders, and other officials related to the water freight movements in CAD must work for betterment of the water freight industry in the region (72.73%). The government and the Department of Transport have responsibility to develop innovative ideas and offer more financial support to maximise the use of small and medium sized ports in CAD (63.64%). Logisticians and freight forwarders can provide better knowledge about the potential of the

water freight in CAD and demonstrate the market clearly to its stakeholders (59.09%).

During the second round of the Delphi survey 73.91% of the expert panel members admitted that professionals and freight forwarders are less aware of the possibilities of water transportation in the region and they need more information on it. As this research provides a complete analysis of the potential for water freight in CAD including its advantages, limitations, suggestions for better water transportation and areas need further research would be helpful for logisticians, freight forwarders and all who related to the industry to understand the importance of water freight compared to other modes of transportation. Through this study the government and the DFT are also getting a chance to improve their awareness about the opportunities and advantages of an increased usage of water freight. The supreme authority to develop water transportation in the SW UK is with the government and DFT. Considering all the benefits of water transportation the government and the DFT could plan innovative ideas and financial supports to attract more users into water freight.

The shipping, logistics and supply chain industry depends on logisticians, freight forwarders and many other service providers to carry out its everyday activities. Experienced logisticians and freight forwarders can play an important role in the promotion of water freight. Their knowledge and experience from the industry and latest information about water transportation's benefits can be utilized to help the potential users of water freight to become well-informed on the potential of water transportation and its market possibilities. Everyone in the industry has to work hard to achieve the goal of an increased usage of water freight in the SW UK. The cooperation and positive attitude of people from the industry towards water transportation can create great changes in water freight movements in the region. As stated earlier this study offers the latest information on the possibilities of water freight in the SW UK especially CAD. Both the industry and the government officials can update their information from the findings of the study to develop

suitable plans, financial aids and create knowledge among the target market segment for water freight.

The focus group discussion suggested that the professionals in the shipping, logistics and supply chain industry should be more active for promoting water freight in the SW UK. The low usage of water freight in the region can be resolved if the people from the industry are ready to follow suggestions formed in the focus group discussion. Since the number of companies exporting and importing in the region are small and few, the focus group advised that a grouping service to share a standard size container for their transportation purpose helps to fill it to a maximum. Thus, the grouping service offers more chances to use water freight in the SW UK. Forming partnerships with big port groups for expanding a small container feeder port and ports in the region to coordinate their activities for better use of water freight is a very important suggestion formed during focus group discussion. Cooperation among the port groups and professionals associated with water freight creates more opportunities for better usage of water transportation by sharing information and infrastructure at the ports.

Another important issue the industry has to consider here is the lack of expertise and human resources to promote water freight in the SW UK. Also, there are not enough professionals who understand maritime problems and its performance in the local authorities and similar government organisations is an obstacle to form policies in favour of water transportation. These issues are very serious and affect the development of water freight in the SW UK. The industry must find out solutions for these issues if it seeks to increase the usage of water freight in the region. As stated in the above paragraph a strong cooperation among the logistics, shipping and supply chain professionals in the industry could be beneficial to identify potential resource persons to represent the industry at the local and other government authorities and they would be able to assist the industry in the promotional activities for water transportation.

The information was collected from the Delphi study and focus group discussion mostly to enable the industry to take initiatives for better water transportation in the SW UK. All the outcomes from the Delphi study and focus group are discussed in detail in chapter 6 and 7.

8.2.3 Implications for policy

The results of the Delphi study and focus group have encouraged the researcher to propose policies for making water freight attractive among the stakeholders. The policies are formed from the suggestions, observations and consensuses produced from the three Delphi surveys and the focus group. Also, studies on diverse aspects of water freight by other researchers provided a basis to form policies derived from existing knowledge. The policies proposed include: promotion of water freight by government, DFT, and European support and Grants, better infrastructure at the ports and improved hinterland connectivity, marketing the benefits of water freight to the industry and the public, promoting small scale water transport, to identify potential barriers to water freight development, collaborative partnerships between all ports in the region, for a feeder port in the region, a new class of marine vessel regulation for coastal/inland waters craft, economic benefits and improving the social status of the region using water freight.

8.2.3.1 Policies

Policy for the promotion of water freight

Water freight has a low profile as a mode of transportation in the SW UK. In this situation, policies by the government, DFT, and the EU have a significant role in promoting water freight in the region. Various studies (European Commission, 2013; Sauri and Turro, 2013; Commission of the European Community, 2006; European Commission, 2006; SKEMA, 2009; UNECE, 2011; Guitierrez and Urbano, 1996; Mihic, et al, 2011; Kavamitsos, 2012; Commission of the European

Communities, 1999; Bendall and Brooks, 2010; West Midlands Regional Assembly, 2007; Association of Inland Navigation Authorities, 2001; Aperte and Baired, 2013; Hilling, 1999; Sea and Water, 2008; and Parliament UK, 2013), reviewed in Chapter 2 provide information about policies, promotional activities and support from the EU and the UK government. Numerous EU studies proposed different activities, programmes and promotional tools to encourage water freight. In the UK, policies and support to deliver better water transportation need to extend beyond FFG.

The Delphi surveys and the focus group findings confirmed that water freight growth in CAD is negatively affected by insufficient government incentives and inadequate promotion by the DFT. They proposed government support through tax reductions, subsidy, strategic investments, incentives, and grants to attract potential stakeholders into water freight. These promotional activities would encourage small scale transportation through all small ports in the region. However, concerted industry level efforts to attract financial assistance, lobbying to influence the regulation of water freight and political initiatives to support strategic investments are necessary.

The most important reason behind the promotion of water transportation concerns environmental conservation. As a government body, DFT promotes sustainable modes of transportation. Given the undisputed sustainability features of waterborne freight many DFT objectives would be achieved through laws and regulations to encourage its usage. To create awareness of its benefits in the popular media, requires reporting of EU success stories from the Netherlands and Italy etc. European Commission projects and funding to promote water freight include Ten-T Motorways of the Sea Projects, Marco Polo, Connecting Europe Facility, Horizon 2020, the European Fund for Strategic Investments and the Cohesion policy. A commission operating at national/ regional/ and local levels is needed to report the demands for developing waterborne freight. A detailed proposal of planned water freight promotional activities would then bid for funding for development.

Freight by Water as a promotional body and the UK's official Short Sea Promotion Centre within the Freight Transport Association have the capability to propose innovative ideas to promote waterborne transportation, including proposals to join The Wash to the River Severn and support for coastal shipping. Active professional organisations in shipping, logistics or supply chains can identify interested members to promote awareness. Working together, a forum of interested professionals would coordinate activities, and share relevant knowledge and experiences. Government is unlikely to ignore their common views, suggestions and strategies

Policy for better infrastructure at the ports and improved hinterland connectivity

The potential for water freight requires sufficient infrastructure at the ports and better hinterland connectivity, as noted in the literature review, Delphi surveys and the focus group. Existing knowledge about the role of infrastructure and hinterland connectivity in water freight is expanding (Tournaye et al, 2010; IWAC, 2007; Li and Notteboom, 2012; WMRA, 2007; CII, 2013; TATA, 2013; Blonk, 1994; Valois et al, 2011; Li and Notteboom, 2011; 1-95 Corridor Coalition, 2005; Sauri and Turro, 2013; and DFT, 2004). The Delphi surveys and the focus group highlighted the deplorable conditions of local ports in terms of infrastructure and hinterland connectivity, as explained chapters 5-7. Delphi surveys found that ports in CAD are lacking infrastructure and hinterland connections due to lack of investments. They require facilities such as container terminals with appropriate handling equipment, cranes for loading/unloading of freight, warehouses, goods transfer facilities and road rail infrastructure to support better hinterland connectivity. The focus group echoed these views, calling for a simple handling shipping structure to run low-cost operations across very short stretches of water.

To improve the infrastructure and develop hinterland connectivity, public investments from the local, regional and national governing bodies are necessary. Funds available at global and EU level for the promotion of water transportation

should be used to develop infrastructure at the ports and hinterland connectivity. Research into the present and future demand for water transportation is required to identify the infrastructure required at the ports and better options for improved hinterland connectivity. Numerous small ports in CAD create opportunities for small scale transportation which require infrastructure to support efficient and effective functioning of small scale water transportation.

Policy for promoting small scale water transport

The benefits, impacts and importance of water transportation were clearly evident in chapter two (Carr, 2011; European Commission, 2013; BVB, 2009; Medda and Trujilo, 2010; Hilling, 1999; Comtois, et al, 1997; Digiesi et al, 2012; Zou at el, 2008; Sambracos and Maniati, 2012; Luttenberger, et al, 2013; Eede, 2010; Yassin et al, 2010; AASHTO, 2013; Toohey, 2002; and Jacob, 2009. The Delphi surveys and the focus group reached consensus that the presence of extensive coastline and accessibility to numerous small local ports are conducive to small scale water transport. The focus group proposed small ships, small containers and a small container port for the promotion of small scale water transportation. Considering the advantages of water transportation, investment is needed into port infrastructure, development of small size ships, small containers, small container ports and links from ports to the hinterland. The existence of ports along the coastline in the region is beneficial in having a final origin or destination at hand for products which helps to relieve road congestion.

The first step in promoting small scale water freight movements is to generate interest among potential customers, through better infrastructure, small container systems and sufficient hinterland connectivity to entice port authorities and professionals in the industry. Port authorities and freight forwarders can encourage their customers to utilize the opportunity for small scale freight movements of non-time sensitive goods. By developing small container systems, small ports can function well. Existing infrastructure at small ports is available to service small-scale transportation of goods to meet the present demand level. As

the demand for small scale water freight progresses, better infrastructure could be provided to meet the requirement, at lower building costs than in larger ports. Smaller ports are often closer to the final destinations of cargoes offering the potential for substantial reductions in road traffic.

Policy for creating a collaborative partnership between all ports in the region

The success of water transportation depends upon its integration into the intermodal transportation. According to Loon (2009) water freight has the capacity to attract higher cargo volume, enhance transport networks and provide genuine door to door services. Studies (Seraphim, and Konstatinos, 2007; Oestvik, and Vassalos, 1999) pointed out the importance of collaboration with other market players to provide complete logistics services. Research (ECE, 1999) mentioned that collaboration among shippers and forwarders is helpful to offer comprehensive networking and door-to-door services at competitive prices. The focus group revealed that ports in the SW UK compete against each other for more business, based on deep-seated attitudes and expectations of competing with each other. Consequently, the current South West Regional Port Association (SWRPA) is not a useful forum within which to promote the benefits of collaborative partnership.

Through its awareness of the potential benefits of water freight, a successful collaborative partnership between all ports in a region can be effective in offering complete logistics services to its customers. Collective actions from all ports in the region irrespective of their size and business volume can help them to avoid bottlenecks to integrate the logistics chain and share their infrastructure and resources for better services. Respective government authorities must take initiatives to start a conversation with different port managements to promote working in cooperation and insist on sharing of necessary information and facilities to benefit all. Since these port authorities are well-established, they are best-placed to offer proper guidelines and action plans to satisfy their customers.

By sharing their knowledge and experiences they could bring more business to the industry, more customers and better infrastructure. Re-forming an association of ports at national and regional level like SWRPA could link ports closely and generate more productive activities.

Policy for a feeder port in the region

The main benefit and aim of using water freight is to decrease traffic volume on the roads. The role of a feeder port in achieving these intended outcomes is well documented (Medda and Trujilo, 2010; British Waterways, 2002; Zou et al, 2008; Paixao and Marlow, 2002; Valois et al, 2011; Sea and Water, 2008). Also, the Delphi studies and the focus group proposed the provision of a regional feeder port as one solution. As container ships increase in size the presence of a feeder port helps the logistics industry to connect with final destinations more easily and opens an opportunity for door-to-door services.

A local feeder port could increase the usage of coastal and short sea shipping in the region, and as ships discharge cargoes very close to the final destination, road traffic demands for road traffic decreases. A feeder port could benefit many industries including food, textiles and oil necessitating industry level pressure to consider the scope for a feeder port in the region. Within CAD the most suitable feeder port location in terms of infrastructure and hinterland connectivity depends on both present and future demand for freight movements.

Policy for a new class of marine vessel regulation for coastal/inland waters craft

The success of water freight will be determined by its integration into intermodal transportation and the door-to-door logistics transport chain. The EC (1999) explained that water transportation should meet some special requirements to deliver intermodalism such as new or specially adapted vessels and advanced and flexible ship designs. While considering the promotion of water freight regionally, the Delphi study and the focus group upheld these criteria. Considering

the population density in the region and demand for goods transportation small ships are ideal for small ports and harbours.

Coastal and inland shipping have different functions to fulfil compared to big commercial ships and require that vessel regulations for the coastal and inland ships are appropriate to the size and weather constraints in the operating ports. To encourage maximum utilization of small ports using small containers or small sized shipments, a new class of marine vessel regulation for coastal/inland waters craft is required. Shipping companies engaged in coastal and short sea shipping can take an initiative to change the current regulations on marine vessels for ensuring vessels suitable for meeting different needs so that they can maximise their business. By developing a new class of marine vessel regulation, the reliability of their service can be increased. Such a development could assist them to face adverse weather conditions and keep their service on time.

Policy for marketing benefits of water freight in the industry and to the public

Literature reviews discussed the importance and advantages of water freight to the freight world and to society. These benefits also have a significant role in raising general living standards. Studies (Digiesi et al, 2012; Luttenberger, et al, 2013; Bonnerjee, et al, 2009; EU Roundtable, 1997; Toohey, 2002; Garratt, 2004; Mulligan and Garry, 2006; EMCT, 2001; US Army Corps of Engineers, 2014) detailed many benefits of water freight. The Delphi study and focus group identified that logisticians and freight forwarders need more information on the potential for water freight in the region.

Knowledge about the possibilities and benefits of water freight among the professionals in the shipping and logistics industry is vital to promote waterborne freight. DFT, local city councils and government organisations dealing with freight movements can publish news about the successful stories of waterborne freight in their official documents and websites. Planning policies of government organisations can give special notifications to the benefits of water transportation.

Organisations working for the betterment of water freight such as Maritime and Waterborne Innovation Group etc. could help professionals and the public to understand the suitability of water freight in the goods movements through their campaigning programmes. Government machinery is geared to deliver the benefits of water freight, as laws and regulations reach their audience quickly and the public in general heeds government actions or policies. Focussed propaganda is required to creating awareness about the advantages of water transportation.

Policy for making economic and social benefits from water transportation

An increase in the usage of water freight offers more employment, lowest environmental costs, reduced road congestion, competitive prices, integration across the region, sustainability and economic progress. Research (Sambracos, 2007; Yassin et al, 2010; European Commission, 2013; AASHTO, 2013; Toohey, 2002; Webb, 2004; Jacob, 2009; Business highbeam, 2014) offers a clear understanding. With the current level of water transportation in CAD, achieving such benefits is difficult. A conscious effort from government organizations is crucial to promote the use of water freight. Promotion may include financial support such as subsidies, tax reductions, grants; conducting awareness programmes and marketing waterborne freight among the stakeholders.

This research identified many explanations for the minimal use of water freight in CAD which could be overcome if attitudes towards water transportation among its stakeholders, the public, government organisations, and the media transformed into a positive outlook. The Delphi study revealed that waterborne freight is considered as slow and unreliable for transporting goods. Though water freight is slow and unreliable due to weather conditions there are many bulk cargoes which can be transported relatively inexpensively using water freight A shift towards transporting bulk cargoes by water offers numerous benefits to society and industry. Local action plans are needed to change the attitudes of everyone involved in waterborne freight.

Water transportation usage offers numerous environmental, economic and societal benefits which increase the quality of life and explain its popularity in the EU. Professional bodies including the CILTUK, UK Chamber of Shipping, Maritime UK, etc. could cooperate to promote waterborne freight regionally. This requires conscious efforts to raise professional awareness of the advantages of water freight and to market these benefits to potential stakeholders to improve attitudes towards water freight. Positive attitudes assist in resolving barriers to development such as insufficient port infrastructure, poor hinterland connectivity, lack of investments, low public support, insufficient government and DFT's financial support and promotion. The Delphi study and focus group identified relatively low demand for cargoes due to a limited regional population. The Delphi study suggested small scale business, development of small container systems, and shipping of small quantities of single bulk cargo as solutions to meet limited local demand. Given numerous small ports locally these solutions utilize port capacity efficiently. Small tidal port with limited drafts exclude larger ships. Consequently, micro businesses using small containers, small quantity shipping, small ships and barges are well suited to local conditions.

Policy to identify potential barriers for water freight

Many factors hamper waterborne freight development (IWAC, 2007; Tournaye et al, 2010; Li and Notteboom, 2012; WMRA, 2007; Webb, 2004; Defra, 2002; Sea and water, 2007). The Delphi study and the focus group identified factors that affect water freight development locally in chapters five, six and seven, including poor port infrastructure and hinterland connectivity, insufficient support from the government and DFT, managerial inertia, cost of double handling, weather and tidal constraints, and low population.

Detailed research needs to engage professionals in each CAD port to identify the barriers to water transportation. The research agenda includes: facilities that ports offer, their capacity, available infrastructure, cost of modal transfer, possible delays, cost of handling cargoes, regulations of marine traffic, draught

requirements, hinterland connectivity, administrative process, the government and DFT support, suitable routes for water freight and the attitudes of stakeholders. Research is needed at the national, regional and local levels. Discussion, interviews and focus groups involving academics and industrial experts are needed to identify barriers blocking the developments of water freight. Professionals with experience of successful implementation in EU countries could share their experiences concerning challenges, implementation difficulties and how they had overcome any issues.

8.4 Modified conceptual models for current and future water freight in CAD

To summarize the findings presented above it is useful to modify the conceptual model formed in Chapter 3 based on the findings and suggestions of the Delphi study and focus group. Figure 8.1 presents current water freight in CAD in accordance with the findings of the Delphi study and focus group. Figure 8.2 presents future water freight in CAD based on the suggestions and findings of the Delphi study and focus group, once they are accepted and implemented by the industry and respective governing bodies.

Figure 8.1 Current water freight in CAD Source: authors own

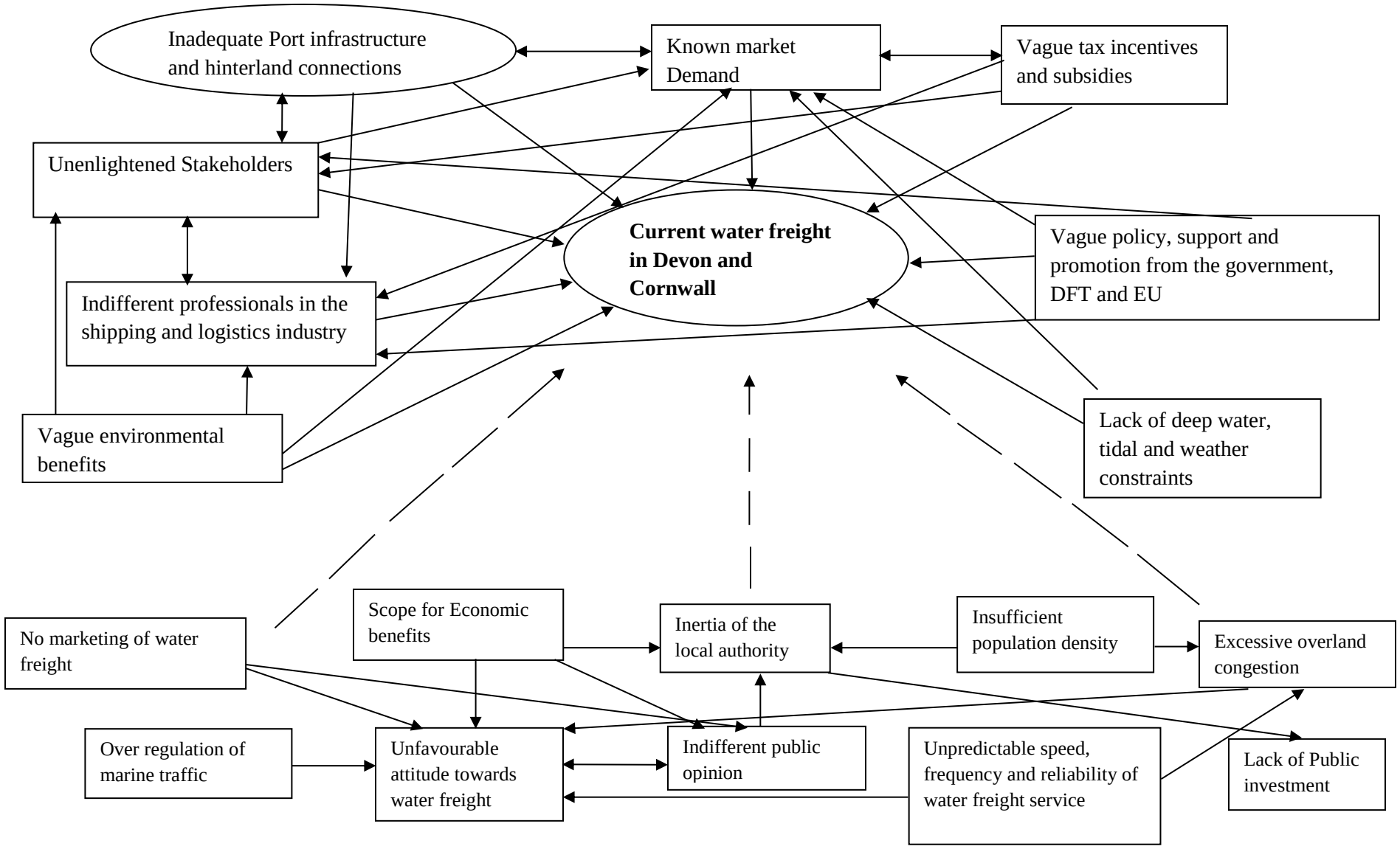
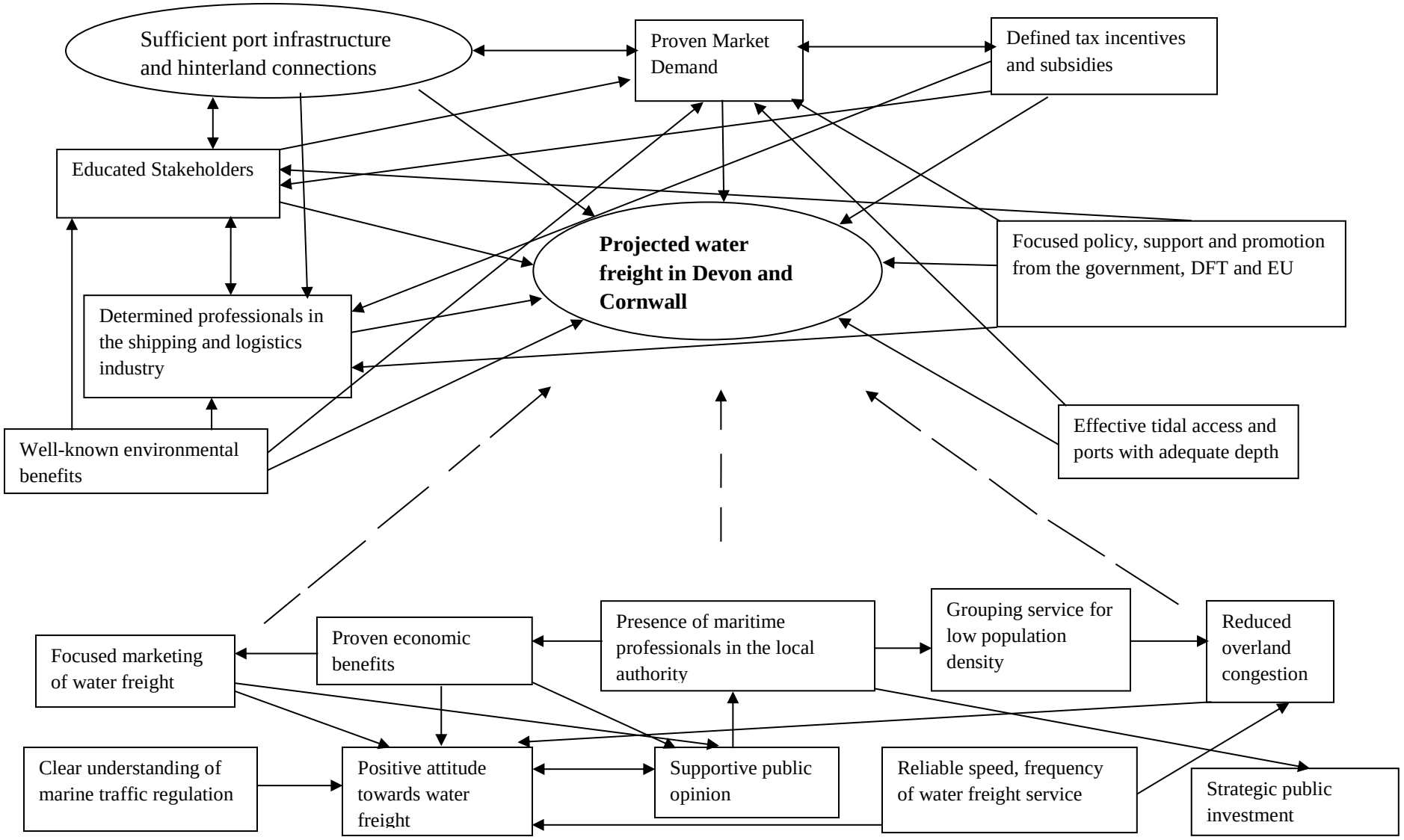


Figure 8.2 Projected water freight in CAD Source: authors own



8.5 Limitations

The research on the potential for water freight in the SW UK used the Delphi technique to address study objectives. Despite following well-documented procedures, a few modifications could have assisted the research. Although not prescriptive, early Delphi survey design guidelines suggested a panel size of 10-50 (Turoff, 1975) or 15-30 in a heterogeneous population (Martino, 1972). Of 200 experts approached, only 29 were interested in participating including 13 from industry, 12 academics, two researchers and two politicians. All were very experienced. Arguably, more equal proportions from each category, including more researchers and politicians might have enhanced the research, but this remains a moot point.

The three Delphi surveys consisted of statements to encourage the expert panel members' independent contributions. Each statement was tested by two industrial experts before distributing the survey. Nevertheless, two statements caused some confusion for three panellists. Both statements incorporated multiple concepts. One statement included a list of benefits that water freight offers, and the other statement concerned just-in-time and door- to-door delivery of non-time-critical goods. Both statements were broad and contained mutually exclusive wordings. A much simpler statement with a supplementary explanation would have been much clearer. All Delphi statements should be short and clear.

The limited local usage of water transportation necessitated a high level of consensus on each statement to get an accurate representation of the local situation. Arbitrarily, setting the agreement level at 75% generated eight consensuses; at 70% this would have risen to 14.

Focus group discussion was adopted to confirm results of the Delphi study findings, engaging members of the Maritime and Waterborne Innovation Group. The location for the focus group discussion was selected according to the participants' convenience, but noise and other distractions from the venue

affected the quality of the recordings. A venue with fewer ambient distractions may have stimulated more intense discussion and reduced transcription times.

This study took place during an economic recession, but a stable and thriving economy favours water freight. Similarly, a limited availability of financial support in the forms of grant, subsidies and incentives may negate the intentions of potential users of water freight. Very recently, the complexities of Brexit imply even more uncertainty regarding sources of funding and the promotion of water freight in the SW UK. Each of these factors implies an ongoing need for further detailed current research.

8.6 Recommendations for future work

The literature reviews, Delphi study and focus group into the potential for water freight in the SW UK revealed the present scenario, future possibilities, barriers to develop water freight in the region, its socio-economic impact and many managerial solutions to overcome the limitations of developing waterborne freight in CAD, fulfilling all the study objectives. However, the findings and possibilities of the study imply further research. Because water transportation is limited in the SW UK, this exploratory work has merely identified practical solutions and barriers to implementation Further research is needed to develop waterborne freight in CAD related to small scale water transport, suitable routes for water freight, development of small container systems, and the major road traffics in the region. The feasibility of water alternatives given current and future infrastructure, a new class of marine vessel regulations for coastal and inland water craft, chances to form a collaborative partnership between all ports, provision for a feeder port, major importers and exporters of the region to identify potential users of water freight among them, and relative costs and benefits of water versus road transport require further research.

Small scale water transport

The Delphi study and focus group identified that in CAD demand for cargoes are always small in quantity due to a limited population. Shippers find it inappropriate to charter large ships to satisfy small demands effectively and efficiently. Consequently, research into using small scale water transport with the help of small ships and barges to ship the demanded quantity of cargoes needs special attention. The research will clarify the practical side of operations, requirements for facilities such as port infrastructure, its feasibility, precautions needed, attitudes and suggestions of port authorities and professionals and barriers to be overcome.

Suitable routes for water freight

Water freight offers a less expensive mode of transportation. There are many factors affecting the competitiveness of water transportation such as weather, tidal constraints and draught requirements. Finding an appropriate route to ports despite weather, tidal constraints and draught requirements is essential for economical operations. An investigation to find the optimal routes for water transport is needed to reduce transportation cost and attract potential users.

Development of a small container system

Small scale water transportation in CAD requires a smaller container system, because standard 20 foot and 40 foot containers may not suit small local cargoes. For importers and exporters transporting small cargoes, small containers save money, time and space. A study to identify the potential for small containers by searching the present demand statistics in the region will help to identify the most appropriate size of containers required to ship cargoes economically.

Main road traffic in the region to find out possible water alternatives

Road traffic is often considered as the most suitable mode of transportation in the region in terms of cost, time and convenience. However, many cargoes using road traffic are suitable for water transportation. An investigation into the current road traffic will identify all the suitable consignments which can be transported using water freight. The study also will help to find out, with the available infrastructure at the ports and hinterland connectivity the quantity of goods which can be shipped using water freight and in future with the support of a better infrastructure at the ports and hinterland.

A new class of marine vessel regulations for coastal and inland water craft

The purposes of inland water shipping and coastal shipping are entirely different for large commercial ships. Vessel design for large ships do not suit coastal and inland shipping. A change in the vessel regulations according to their purpose of usage could support the maximum capacity utilization of the vessel. A study on a new class of marine vessel regulations for coastal and inland water craft is needed to design a vessel appropriate to coastal and inland shipping.

To form a collaborative partnership between all ports

A collaborative partnership between all ports in the region is necessary for the smooth running of water freight in CAD. Water transportation aims to deliver cargoes close to their final destinations more frequently. To operate water freight requires information, and facilities sharing. At present ports in the region are managed by different business groups who run their own businesses independently. An investigation into forming a business partnership between port managements for developing water freight in CAD could identify the possibilities, difficulties, and demands of port management needed to form such partnerships.

Provision for a feeder port

A feeder port in the SW UK can support the distribution of goods close to their destinations using inland or coastal shipping, raising the importance of water freight in the region. When the usage of water freight starts to develop, automatically the dependence on road freight will decrease. A study to find out the necessity for a feeder port could identify the benefits of brings to the industry and society, and the steps to develop it.

To identify potential users of water freight among major exporters and importers

Market research is needed to find out the potential users of water freight among the major exporters and importers locally. By collecting data from various sources such as DFT, professional organisations concentrating on shipping, logistics and supply chain management will provide business data including potential customers' demands and expectations. The research also investigates present and future expansions needed to adjust to changing demand for water transportation.

Relative costs/benefits of water vs road transport

Water freight in many countries is running very successfully, based on extensive research. In the UK studies of the relative benefits and costs of water transportation against other modes are rare. Consequently, professionals, government and the public have limited information. Study into the relative costs and benefits of water freight versus road transport is needed to highlight the advantages of water freight, and costs compared to road transport, thereby raising professional awareness.

Work to substantiate findings from the Delphi panel includes investigation of the regional potential for microbusiness. Details of the demand for small scale shipping, and the related investment and systems to accommodate it are needed, along with the comparative costs and benefits of small systems rather than large commercial ships.

References

AASHTO, (2013). *Waterborne Freight Transportation: Bottom line Report.,* Washington, DC : American Association of State Highway and Transortation Officials.

Abrahamsson, M. & Stanve, F. and Aidin, N.,(2003). Logistics platforms for improved strategic flexibility. *International Journal of logistics: Research and applications,* 6(3), pp. 85-106.

A&P Group Limited, (2014)., [Online]., Available at http://www.ap-group.co.uk/. Accessed on 15th August 2014.

Ariel. A, (1989). Delphi Forecast of the Dry Bulk Shipping Industry in the year 2000. *Maritime policy and management,* 16(4), pp. 306-336.

Association of Inland Navigation Authorities., (2001). *Strategy for freight on Britain's Inland Waterways,* London: AINA.

Baird, A. J., (2003). *UK Marine Motorways Study Summary Final Report,* Edinburgh: EPSRC, DFT.

Baired, A. J and Aperte, G.X., (2013). Motorways of the sea policy in Europe. *Maritime policy and management,* 40(1), pp. 10-26.

Ballou, (2004). *Business Logistics/Supply Chain Management.* 5th ed. New Jersey: Pearson Prentice Hall.

Barbour, R. and Kitzinger, J. (eds) (1999) *Developing Focus Group Research: Politics, Theory and Practice*. London: Sage

Beech. B, (1997). Studying the future: a Delphi study of how multi-disciplinary clinical staff view the likely development of two community mental health centres over the course of the next 2 years. *Journal of advanced nursing,* Volume 25, pp. 331-338.

Blonk, (1994). Short sea shipping and inland waterways as a part of sustainable transportation system. *Marine pollution bulletin,* 29(6-12), pp. 389-392.

Bloor, M., Frankland, J., Thomas, M and Robson, K. (2001) *Focus Group in Social Research*. Thousand Oaks: Sage

Bloor, M (1997) 'Techniques of validation in qualitative research: a critical commentary', in G. Miller and R Dingwall (eds) *Context and Method in Qualitative Research*. London: Sage

Bojkova, V., Leggate, H and McConville, J., (2005). *The water freight review 2005.* 1st ed. London: London Metropolitan University.

Bonnerjee, S.,Cann, A., Koethe, H., Lammie, D., Lieven, G., Muskatirovic, J., Ndala, B., Pauli, G and White, I., (2009). Inland waterborne transport: Connecting countries, Paris: United Nations Educational, Scientific and Cultural Organization,.

Boss, P., Doherty, W.J.,Larossa, R., Schumm, W., and Steinmentz, S.K. (1993). *Sourcebook of Family Theories and Methods: A Conceptual Approach*. New York: Plenum

Brett, V. and Roe, M, (2010). The potential for the clustering of the maritime transport sector in the Greater Dublin Region. *Maritime policy and management,* 37(1), pp. 1-16.

British Marine Federation, (2010). London: British Marine Federation.

British waterways, (2002). *New freight energy on inland waterways ,* Watford: British waterways.

British Waterways London., (2002). Developing Water Borne Freight on the West London Canal Network, London: British Waterways London and Transport for London.

Brooks, M. R.and Bendall, H.B., (20100. *Short sea shipping: Lessons for or from Australia,* Australia: Intitute of Transport and Logistics Studies.

Brownrigg, M (2015) *Red Tape Challenge; Maritime and Rail Transport: Sector Champions* [Online] Available at www.redtapechallenge.cabinetoffice.gov.uk/maritime-and-rail-transport-sector-champions/ [Accessed 12 March 2015]

Bryman and Bell. (2015). *Business Research Methods*. 4th edn. Oxford: Oxford University Press.

Burn, S.A.,(1984). Water freight transport-survival or revival. *Land use policy,* 1(2), pp. 134-146.

Business HighBeam , (2014). Water Transportation of Freight, NEC. [Online] Available at: www.business.highbeam.com/industry-reports/transport/water-transportation-of-... [Accessed 29 January 2014].

Butterworth., and Bishop. V, (1995). Identifying the characteristics of optimum practice: findings from a survey of practice experts in nursing, midwifery and health visiting. *Journal of advanced Nursing,* Volume 22, pp. 24-32.

BVB, (2009). *The power of inland navigation,* Rotterdam: Dutch inland shipping information agency.

Carr, S., Shipping and Marine, (2011) Water Benefits, [Online] Available at http://www.shippingandmarine.co.uk/article-page.php?contentid=13104&issueid=397 [Accessed 11th June 2012]

Carrick District Council, (2007) *Ports of Truro and Penryn: Port Master Plan*. [Online] Available at www.**port**of**truro**.co.uk/download/**port**-**masterplan** **[Accessed 15th July 2014]**

Centre for Sustainable Transportation, (2002). *Definition and Vision of Sustainable Transportation.* [Online] Available at: http://cst.uwinnipeg.ca/documents/Definition_Vision_E.pdf. October 2002 [Accessed 3rd February 2014].

centro, (2013). *West Midlands Freight Strategy 'Vision & Key Issues Consultation',* Birmingham: Centro.

Cetin, C, K. and Cerit, A ,G, (2010). Organizational effectiveness at seaports: a systems approach. *Maritime policy and management,* 37(3), pp. 195-219.

Chang, Y. C., (2011). Maritime clusters: What can be learnt from the South West of England. *Ocean and Coastal Management,* Volume 54, pp. 488-494.

Chocholik, J. Bouchard, S., Tan, J., and Ostrow, D, (1999). The determination of relevant goals and criteria used to select an automated patient care information system: a Delphi approach. *Journal of the American Informatics Association,* 6(3), pp. 219-233.

CII, (2013). *Coastal shipping an Environment friendly alternative.* Mumbai, Confederation of Indian Industry Institute of Logistics.

Clayton M. J, (1997). Delphi: A technique to harness expert opinion for critical decision making tasks in education. *Educational Psychology: An international journal of experimental educational psychology,* Volume 17, pp. 373-387.

Comtois, C., Slack, B and Sletmo, G., (1997). Political isuues in inland waterways port development: prospects for regionalization. *Transport Policy,* 4(4), pp. 257-265.

1-95 Corridor Coalition., (2005). *Shortsea and coastal shipping options study,* 1-95 Corridor Coalition.

Commission of the European Communities., (1999). *The development of SSS in Europe; A dynamic alternative in sustainable transport chain,* Luxembourg: Office for official publications of the European Communities.

Commission of the European Communities., (2006). *COMMUNICATION FROM THE COMMISSION TO THE COUNCIL, THE EUROPEAN PARLIAMENT, THE EUROPEAN ECONOMIC AND SOCIALCOMMITTEE AND THE COMMITTEE OF THE REGIONS,* Brussels: Commission of the European Communities.

Commission of the European Communities., (2007). *Communication from the Commission; Freight transport logistics action plan,* Brussels: Commission of the European Communities.

Cooper, D, R. and Schindler P. S, (2014). *Business Research Methods.* 12th ed. New York: McGraw Hill Education.

Coosa-Alabama River Improvement Association, (2013). *Waterway Facts.* [Online]
Available at: www.caria.org [Accessed 29 January 2014].

Cornick. P, (2006). Nitric oxide education survey- use of a Delphi survey to produce guidelines for training neonatal nurses to work with inhaled nitric oxide. *Journal Neonatal Nursing,* 12(2), pp. 62-68.

Cornwall Council., (2004). *Cornwall Structure Plan,* Truro: Cornwall Council.

Cornwall Council., (2012). *A future for Maritime Cornwall: The Cornwall Maritime Strategy 2012-2030,* Truro: Cornwall Coucil.

Cornwall Council., (2014). *Cornwall Council.* [Online]
Available at: www.cornwall.gov.uk [Accessed 8 March 2014].

Critcher. C, and Gladstone. B, (1998). Utilizing the Delphi technique in policy discussion: A case study of a privatized utility in Britain. *Public Administration,* Volume 76, pp. 431-449.

Cross. V, (1999). The same but different: A Delphi study of clinicians and academics perceptions of physiotherapy undergraduates. *Physiotherapy,* 85(1), pp. 28-39.

Dalkey. N. C, (1969). *The Delphi method: An experimental study of group opinion, Document Number- RM- 5888-PR.* California , The Rand Corporation.

Dalkey. N. C, (1972). *Studies in the quality of life. Delphi and decision making,* Lexington: Lexington.

Deborah, M., (2001). Flow progress. *Geographical,* 73(1), p. 42.

defra, (2000). *Waterways for Tomorrow,* London: Department for Environment, food & Rural Affairs.

Delbecq. A. L, Van de Ven. A. H, and Gustafson. D. H, (1975). *Group Techniques for Programme Planning: A Guide to Nominal Group and Delphi Processes.* Illinois, Scott, Foresman and Company.

Department for Transport,(2017). *Waterborne freight in the UK-Technical notes,* London: DFT.

Devon County Council., (2004). Devon Structure Plan 2001 to 2016, Exeter: Devon County Council.

Devon County Council., (2008). Maritime Devon County Council's Role and Action Programme, EXeter: Devon County Council.

Devon County Council., (2011). Population estimates. [Online] Available at: www.devon.gov.uk [Accessed 6 February 2014].

DFT, (2017). *UK ports and traffic, 2017,* London: DFT.

DFT, (2016). *Transport Statistics Great Britain December 2016*, London: DFT

DFT, (2010). *Freight Best Practice Choosing and developing a multi-modal transport solution ,* London: DFT.

DFT, (2008). *Delivering A Sustainable Transport System: The Logistics Perspective*, London: CFT

DFT, and Defra., (2002). *The Government's response to the report of the Freight Study Group Freight on Water – A New Perspective,* London: Defra and DFT.

Digiesi, S., Moosa, G and Mummolo, G., (2012). A loss factor based approach for sustainable logistics. *Production planning and control: the management of operations,* 23(2-3), pp. 160-170.

Dinwoodie. J, Landamore. M, and Rigot-Muller. P, (2014). Dry bulk shipping flows to 2050: Delphi perceptions of early career specialists. *Technological Forecasting & Social Change,* Volume 88, pp. 64-75.

Dinwoodie. J, Tuck. S, and Rigot-Muller. P, (2013). Maritime oil freight flows to 2050: Delphi perceptions of maritime specialists. *Energy Policy,* Volume 63, pp. 553-561.

Donohoe. H, Stellefson. M, and Tennant. B, (2012). Advantages and limitations of the e-Delphi technique. *American Journal of Health Education,* 43(1), pp. 38-46.

Duffield. C, (1993). The Delphi technique: a comparison of results obtained using two expert panels. *International Journal of Nursing studies,* Volume 30, pp. 227-237.

Dupin, C., (2002). The short sea alternative. *Journal of Commerce,* pp. 16-17.

Duru. O, Bulut. E, and Yoshida. S, (2012). A fuzzy extended Delphi method for adjustment of statistical time series prediction: An empirical study on dry bulk freight market case. *Expert systems with Applications,* Volume 39, pp. 840-848.

Dutch Inland Shipping Information Agency, (2004). *The power of inland navigation,* Rotterdam: s.n.

ECMT, (2001). *Short Sea Shipping In Europe ,* Paris: ECMT.

EDINA, (2014)., [online] Available at http://digimap.edina.ac.uk/., Accessed on 2nd September 2014.

Eede, E.V.d., (2010). 125 years 0f promoting waterborne transport. *Proceedings of ICE, Civil Engineering,* 163(5), pp. 4-7.

Efstathiou. N, Ameen. J, and Coll. A-M, (2008). A Delphi study to identify healthcare users priorities for cancer care in Greece. *European Journal of Oncology Nursing,* 12(4), pp. 362-371.

European Commission, (1999). *The development of short sea shipping in Europe: a dynamic alternative in a sustainable transort chain,* Brussels: European Commission.

European Commission., (2001). European Transport policy for 2010: Time to decide, Brussels: European Commission.

European Commission,(2006). *Motorways of the sea modernising European short sea shipping links.* Belgium, DG Energy and Transport..

European Commission,(2013). *Thematic Research Summary Water Transport,* s.l.: Transport Research and Innovation Portal (TRIP).

European Commission., (2012) *Environment: New rules on cleaner fuels for shipping will deliver benefits for people's health* [Online] http://europa.eu/rapid/press-release_IP-12-1375_en.htm [Accessed 27/06/2015]

European Commission, (2014). *NAIADES II.* [Online] Available at: www.europa.eu
[Accessed 14 January 2014].

European Conference of Ministers of Transport, (1998). *Report on te current state of combined transort in Europe.* Paris, EMCT.

Eurostat., (2017). *Maritime transport statistics - short sea shipping of goods*[Online]. Available: http://ec.europa.eu/eurostat/statistics-explained/index.php/Maritime_transport_statistics_-_short_sea_shipping_of_goods[Accessed 16June 2017]

Eurostat, (2015). *Maritime ports freight and passenger statistics* [Online]. Available: http://ec.europa.eu/eurostat/statistics-explained/index.php/Maritime_ports_freight_and_passenger_statistics#Liquid_bulk_made_up_38_.25_of_the_total_cargo_handled[Accessed 14 June 2017]

Everett. A, (1993). Piercing the veil of the future: a review of the Delphi method of research. *Professional Nurse,* Volume 9, pp. 181-185.

Fadda. E, (1997). *Brazilian Coastal Shipping in 2010: Qualitative Scenarios through the Application of Delphi and Scenario Writing Methods,* Cardiff: University of Wales College.

Falmouth Harbour Commission, (2003)., *The Falmouth & Truro Ports Handbook.*, land and Marine Publications LTD., Essex

Fischer, T. B., (1999). Comparative analysis of environmental and socio-economic impacts in SEA for transport related policies, plan, and programs. *Environmental Impact Assessment Review ,* 19(3), pp. 275-303.

Flink. A, (2003). *The survey kit.* 2nd ed. Thousand Oaks: CA: Sage.

Fowey Harbour Commissioners, (2012)., *PORT INFORMATION AND GUIDE TO PORT*

ENTRY,. Harbour Office., Fowey.

Frankland, J. and Bloor, M. (1999) ' Some issues arising in the systematic analysis of focus group materials', in R. Barbour and J. Kitzinger (eds) *Developing Focus Group Research*. London: Sage.

Freight by Water., (2009). *Analysing the benefits of water based freight,* London: Freight by Water

Garratt, M., (2004). *Short sea and waterway freight- the position today.* London, MDS Transmodal.

Geographical, (2001). In with the old, out with the new. *Geographical,* 73(1), p. 42.

Geurs, (2009). Social impacts of transport: Literature review and the state of the practice of transport appraisal in the Netherlands and the United Kingdom. *Transport Review: A Transnational Transdisciplinary Journal,* 29(1), pp. 69-90.

Gibson. L.J, and Miller. M. M, (1990). A Delphi model for planning pre-emptive regional economic diversification. *Economic Development Review,* Volume Spring, pp. 35-41.

Glaves,P., Rotherham, I.D., Harrison, K and Egan, D., (2007). *An initial review of the economic and other benefits of inland waterways,* Sheffield: Inland waterways Advisory Council.

Goldfisher. K, (1992). Modified Delphi: A concept for new product forecasting. *Journal of Business Forecasting,* Volume 11, pp. 10-11.

Google, (2014). *Google images.* [Online] Available at: www.google.com [Accessed 15 August 2014].

Gordon. T. J, (1992). The methods of futures research. *Annals of the American Academy of Political and Social Science,* Volume 522, pp. 25-36.

Greenbaum, T., (2000) *Moderating Focus Groups*. Thousand Oaks: Sage

Greenbaum, T. (1998) *The Handbook for Focus Group Research*, 2nd edn. Thousand Oaks: Sage

Grosso, M., Lynce, A.R., Silla, A and Vaggelas, G.K., (2008). *Parameteters influencing short sea shipping pricing scheme: Italian operators point of view.* Ascona, STRC.

Guitierrez and Urbano, (1996). Accessibility in the EU: The impact of the Trans-European road network. *Journal of transport Geography,* 4(1), pp. 15-25.

Gupta. U. G, and Clarke. R. E, (1996). Theory and applications of the Delphi technique: A bibliography (1975- 1994). *Technological forecasting and social change,* Volume 53, pp. 185-21.

Gutierrez. O, (1989). Experimental techniques for information requirement analysis. *Information and Management,* Volume 16, pp. 31-43.

Hasson. F, and Keeney. S, (2011). Enhancing rigour in the Delphi technique research. *Technological Forecasting & Social Change,* Volume 78, pp. 169-1704.

Hasson. F, Keeney. S, and McKenna. H, (2000). research guidelines for the Delphi survey. *Journal of Advanced Nursing,* 32(4), pp. 1008-1015.

Hilling, D., (1999). Inland shipping and maritime link. *Marit & Energy,* Volume 136, pp. 193-197.

Hulten,V.M., (1977). Propects for the development of inland water transport in Europe. *Geo Journal*, 1(2), pp. 7-24.

Hussey. R, and Collis, j., (2003). *Business Research.* 2nd ed. Bristol: Palgrave MacMillan.

Hwang, K. S, (2004). *A Comparative Study of Logistics Services in the Container Liner Shipping Market in the U.K. and South Korea.,* Plymouth: University of Plymouth.

Inland Waterways Users Board., (2006). 20th Annual report to the Scretary of the Army and the US Congress, Washington D.C: Inland waterways users board.

Islam, D. M. Z, Dinwoodie, J, and Roe. M, (2006). Promoting development through multimodal freight transport in Bangladesh. *Transport reviews,* 26(5), pp. 571-591.

IWA,(2012). *Policy on freight on inland waterways,* Chesham: Inland waterways Association.

iwac,(2007). *The inland waterways of England and Wales in 2007,* London: Inland Waterways Advisory Council.

Jackie, C., Dianne, P., Christine, D., Anne, A., and Sue, N., (1997). The Delphi Method. *Nursing Research,* 46(2), pp. 116-118.

Jacob, N.G.,(2009). *The Environmental & Economic Benefits of Short Sea Shipping by 'Container-On-Barge',* Michigan: wordpress.com.

Jairath, N., and Weinstein, J., (1994). The Delphi methodology: a useful administrative approach. *Canadian Journal of Nursing Administration,* Volume 7, pp. 29-42.

Jones, J. M . G., Sanderson, C. F. B., and Black, N. A, (1992). What will happen to the quality of care with fewer junior doctors? A Delphi study of consultant physicians views.. *Journal of the Royal college of Physicians ,* Volume 26, pp. 36-40.

Kavamitsos, F., (2012). *Boosting inland waterway transport in Europe.* [Online] Available at: www.risiinfo.com [Accessed 12 February 2013].

Keeney, S, (2009). The Delphi technique. In: Gerrish, K., Lacey, A, ed. *The research process in nursing.* London: Blackwell Publishing.

Keeney, S., Hasson, F., and McKenna, H. P, (2001). A critical review of the Delphi technique as a research methodology for nursing. *International Journal of Nursing,* Volume 38, pp. 195-200.

Kennedy, P. H, (2004). Enhancing Delphi research: methods and results. *Journal of Advanced Nursing,* 45(5), pp. 504-511.

Kirk, J., and Miller, M. L, (1986). Reliability and Validity in Qualitative research. Beverly Hills: Sage publications.

Kitchin, R., Tate, N. (2000) Conducting Research into Human Geography, Harlow: Prentice Hall

Kitzinger, J. (1994) 'Focus groups: method or madness?', in M. Boulton (ed.) *Challenge and Innovation: Methodological Advances in Social Research on HIV/AIDS*. London: Taylor and Francis

Konstatinos, P and Seraphim, K., (2002). *"Strategic market segments and prospects of Short Sea Shipping in the Eastern Mediterranean and the Black Sea".* Cambridge, Association of European Transport.

Kreutzberger, E., (2001). Strategies to achieve a quality leap in internodal rail or barge transportation, Oakland: IEEE.

Krueger, R. A., and Casey, M. A, (2009). *Focus Groups: A Practical Guide for Applied Research.* 4th ed. Thousand Oaks: CA: Sage.

Krueger, R. A. (1998) *Moderating Focus Groups*. Thousand Oaks: Sage

Krueger, R.A. (1994) *Focus Groups: a Practical Guide for Applied Research*, 2nd edn. Thousand Oaks: Sage

Kuznetsov, A, (2014) Port Sustainability Management System for Smaller Ports in Cornwall and Devon, PhD Thesis, University of Plymouth, UK

Lacey, A, (2010). The research process. In: *The research process in Nursing.* United Kingdom: Wiley-Blackwell, pp. 13-35.

Landeta, J, (2006). Current validity of the Delphi method in social science. *Technological Forecasting & Social Change,* Volume 73, pp. 467-482.

Lee, P.T.W., Hu, K. C and Chen, T., (2010). External costs of domestic container transportation: Short sea shipping versus trucking in Taiwan. *Transport Reviews: A Transnational Transdisciplinary Journal,* 30(3), pp. 315-335.

Li, J and Notteboom, T., (2011). *The evolutionary path of inland waterway transport in the Pearl river delta in China: The role of governance and institutions.* s.l., University of Aegean.

Li, J and Notteboom, T., (2012). *The development of the inland waterway transport system in flanders(Belgium): An institutional analysis,* Vancouver: Antwerp Maritime Academy.

Lindeman, C, (1975). Delphi survey of priorities in clinical nursing research. *Nursing Research,* Volume 24, pp. 434-441.

Linstone, H., and Turoff, M, (1975). *The Delphi Method: Techniques and Applications,* Reading Massachusetts: Addison-Wesley.

Lombardo, G. A., (2004). *Short Sea Shipping: Practices, Opportunities and Challenges.* [Online] Available at: www.insourceaudit.com [Accessed 10 January 2014].

Longman, P., (2010). The shipping news: Start moving freight by water again, and we'll use less oil, emit less carbon, cut highway traffic—and perhaps even save St. Louis.. *The Washington Monthly*, July.

Loo, R, (2002). The Delphi method: a powerful tool for strategic management. *Policing: An international journal of Police strategies & management,* 25(4), pp. 762-769.

Loon, C. K., (2009). Short sea transport and economic development in Penang. *Business intelligent journal,* 2(2).

Luttenberger, L.R, Ancic.I and Sestan.A., (2013). *The Viability of Short-Sea Shipping in Croatia,* Opatija: Komunalac d.o.o.

Maeer, G and Millar, G., (2004). Evaluation of UK waterway regeneration and restoration. Proceedings of the ICE, June, pp. 103-109.

Maniati, M and Sambracos, E.,(2012). Competitiveness between short sea shipping and road freight transport in mainland port connections; the case of two Greek ports. *Maritime Polocy and management,* 39(3), pp. 321-337.

Manson, E. J., and Bramble, W. J, (1989). *Understanding and conducting research.* 2nd ed. NEW York: McGraw-Hill.

Martino, J. P, (1972). *Technological forecasting for decision making,* New York: Elsevier Publishing.

Mayer, N, (2013). Interreg IV A France(Manche-Channel)-England/Project Maritimes-Maritime projects/ Catalogue/Dec-2013

McLntire, S. A., and Miller, L. A, (2005). *Foundations of Psychological Testing.* London and New York: Sage Publishing Company.

McMillon, J.H., and Schumacher, S. (2000). Research in Education: A Conceptual Introduction (Fifth ed.), New York: Longman

Meyrick, J. De, (2002). The Delphi method and health research. *Health Education,* 103(1), pp. 7-16.

Michael, S., Beck, L., Bryman, A., and Liao, (2004). *The Sage Encyclopaedia of Social Science Research Methods.* Volume 1 ed. Thousand Oaks: Sage Publications.

Mihic,S., Golusin, M. and Mihajlovic.,(2011). Policy and promotion of sustainable inland waterway transport in Europe. *Renewable and sustainable energy reviews,* Volume 15, pp. 1801-1809.

Miles. M. B, Huberman. A. M and Saldana. J, (2014). *Qualitative Data Analysis*. Sage Publications, 3rd Edition, London

Mitchell, V, (1992). Using Delphi to forecast in new technology industries. *Marketing Intelligence and Planning,* Volume 10, pp. 4-9.

Mode shift Centre, (2012). *Why use water freight* [online]. Available: http://www.modeshiftcentre.org.uk/water_freight/why_use_water_freight/ [Accessed 12 August 2017]

Morgan, D.L (1997) *Focus Group as Qualitative Research*, 2nd edn. Thousand Oaks: Sage

Morgan, D.L. (1998) *The Focus Group Guidebook*. Thousand Oaks: Sage

Mulligan, R.F and Lombardo, A.G., (2006). *Short sea shipping : Alleviating the environmental impact of economic growth.* [Online] Available at: www.wcu.edu [Accessed 9 January 2014].

Murphy, M. K., Black, N., Lamping, D. L., McKee, C. M., Sanderson, C. F. B., and Askham, J, (1998). Consensus development methods and their use in clinical guideline development. *Health technology assessment,* 2(3).

Murry Jr, J.W., and Hammons, J. O, (1995). Delphi: A versatile methodology for conducting qualitative research. *Review of Higher Education,* 18(4), pp. 423-436.

National Waterways Foundation, (2008) *NEW NATIONAL STUDY COMPARES FREIGHT TRANSPORTATION BY BARGE, TRUCK AND TRAIN* [Online]. Available: http://www.nationalwaterwaysfoundation.org/study/NWF%20TTI%20Study%20wire%20release.pdf [Accessed 18 June 2017]

New, S., & Tomlinson, G. (1994). Supply-Chain Integration Hype or Reality?. Logistics Focus, 2, 5-5.

North West Freight Advisory Group., (2003). North West Regional Freight Strategy, Leeds: North West Freight Advisory Group.

Okoli, C., and Pawlowski, S. D, (2004). The Delphi method as a research tool: an example, design considerations and applications. *Information & Management,* Volume 42, pp. 15-29.

Ono, R., and Wedemeyer, D. J, (1994). Assessing the validity of the Delphi technique. *Futures,* 26(3), pp. 289-304.

Packer, J.J.L., (1995). UK roads to water initiative: a focusing study. In: Wijnolst,N., and. Peeters, C., ed. *European Shortsea Shipping.* Athens: Delft University Press, pp. 501-511.

Paixao, and Marlow., (2007). The Impact of the Trans-European Transport Networks on the Development of Short Sea Shipping. *Maritime Economics & Logistics,* Volume 9, pp. 302-323.

Paixco, and Marlow., (2002). Strengths and weaknesses of short sea shipping. *Marine Policy,* Volume 26, pp. 167-178.

Parliament UK., (2013). *Transport Committee Written evidence from Peel Ports (PA 10),* London: Parliament UK.

Patton, M, (2002). *Qualitative reseach and evaluation method.* 3rd ed. Thousand Oaks, CA: Sage publications.

Paz, M. A.G., Orive. A, C., and Cancelas, N. G, (2014). *Use of the Delphi method to determine the constraints that affect the future size of large container ships.* [Online]
Available at: http://www.tandfonline.com [Accessed 12 June 2014].

Perakis, A.N.,(1999). Recent technical and management improvements in US inland waterway transportation.. *Maritime Policy and Management,* 26(3), pp. 265-278.

Perakis, A.N and Denisis. A..,(2008). A survey of short sea shipping and its prospects in the USA. *Maritime Policy and Management,* 35(6), pp. 591-614.

Pill, J, (1971). The Delphi method: substance, context, a critique and an annotated bibliography. *Socio-Economic Planning and Science ,* Volume 5, pp. 57-71.

Platz, T., (2008). *Market perspectives for inland waterway shipping in Intra-European intermodal transport,* Germany: Association for European Transport and Contributors.

Plymouth City Council, (2010)., *Port of Plymouth Evidence Base Study, Final Report-Volume 2*., Plymouth

Polit, D., Beck, C., and Hungler, B, (2001). *Essentials of nursing research-methods appraisal and utilisation,* Philadelphia: Lippincott.

Port of Truro., (2014) [Online]., Available at http://www.portoftruro.co.uk/about-the-port/., Accessed on 15th August 2014.

Powell.C, (2003). The Delphi technique: myths and realities. *Journal of Advanced Nursing,* 41(4), pp. 376-382.

Prokesch, S.,(2010). The sustainable supply chain. *Harvard Business Review,* 88(10), pp. 70-72.

Reid, N. G, (1988). The Delphi Technique: its contribution to the evaluation of professional practice. In: E. R, ed. *Professional competence and quality assurance in the caring professions.* New York: Chapman and Hall, pp. 230-254.

Rich, C. A., (1983). *Short sea shipping in the economy of inland transport in Europe.* Paris, Economic research centre.

Roger, W., (1979). *Canals revived.* 1st ed. Wiltshire: Moonraker Press.

Rowe, G., Wright, G., and Bolger, F, (1991). A re-evaluation of research and theory. *Technological Forecasting & Social Change,* Volume 39, pp. 235-251.

Rowlinson, M and Wixey, S.,(2002). *The politics and economics of developing coastal shipping,* Panama: International Association of Maritime Economist.

Rowlinson, M.,(2009). *Shipping freight by water in Britain and Ireland.* 1st ed. Ceredigion: The Edwin Mellen Press.

Sackman, H, (1975). *Delphi critique.* Boston: Lexington Books.

Saldanha, and Gray, R., (2002). The potential for British coastal shipping in a multimodal chain. *Maritime policy and Management,* 29(1), pp. 77-92.

Sambracos, E., (2007). *The development of short sea shipping in the Eastern Mediterranean Region,* Egypt : Proceedings of 10th International Maritime Conference MARDCON Ain Sokhna .

Saunders, M., Lewis, P., and Thornhill, A, (2009). *Research Methods for Business Students.* 5th ed. Harlow: Pearson Education Limited.

Saunders, M., Lewis, P., and Thornhill, A, (2012). *Research Methods for Business Students.* 6th ed. Essex: Pearson Education Limited.

Sauri, A.K.Y., and Turro, M., (2013). Shortsea shipping in Europe:Issues, policies and challenges. In: M. a. H. T. Finger, ed. *Regulating transport in Europe.* Cheltenham: Edward Elgar, pp. 196-217.

Schmidt, W. C, (1997). World-wide web survey research: benefits, potential problems and solutions. *Behav Res Methods,* Volume 29, pp. 274-279.

Sea and Water., (2007). *The potential for water freight in the UK,* London: DFT.

Sea and Water, (2008). *A vision for uk freight trends towards 2018 and beyond,* London: Sea and Water.

Sekaran, U., (2003). *Research Methods for Business A skill Building Approach.* 4th ed. United States of America: John Wiley & Sons Ltd.

Sekaran, U., (2009). *Research Methods for Business.* 4th ed. New York: John Wiley & Sons Ltd.

Sekaran, U., and Bougie, R, (2013). *Research Methods for Business.* 6th ed. West Sussex: John Wiley & Sons Ltd.

Sidaway, C., Price, T.J and Probert, S. D., (1995). Transportation via canals: Past, Present and Future. *Applied Energy,* Volume 51, pp. 1-17.

Silver, P. (1983). *Educational Administration: Theoretical Perspective on Practice and Research*. New York: Harper & Row.

Silverman, D, (1994). *Interpreting Qualitative Data.* London: Sage.

SKEMA, (2009). *Sustainable Knowlwdge Platform for the European Maritime and Logistics Industry.* Latvia, Seventh Framework Programme.

Smith, M. E., Thorpe, R., and Jackson, P. R, (2008). *Management Research.* 3rd ed. London: Sage.

Spencer-Cooke, B, (1989). Conditions of participation in rural, non-formal education programs: a Delphi study. *Educational Media International ,* 26(2), pp. 115-124.

Stevenson, J. S, (1990). Development of Nursing Knowledge: Accelerating the Pace. In: N. Chaska(Ed), ed. *The Nursing Profession Turning Points.* Mosby: St Louis, pp. 567-606.

SWRA, (2002). *Regional planning and transport groups 2002-2009,* Somerset: South West Regional Planning Body.

SWRPA, (2009). *Gateways for growth,* Teignmouth: South West Regional Ports Association.

SWRPA, (2011). *Ports and Harbours in the South West region of Britain,* Teignmouth: South West Regional Ports Association.

SWRPA (2011) South West Regional Ports Association A-Z Index of Ports, Available at: http://swrpa.org.uk/a_z_Index.asp (Oct 2013)

Tailor, J., (1993). Remove barriers to intermodal. *Transportation and distribution,* 34(4), p. 34.

Tapio, P, (2002). Disaggregative policy Delphi. Using cluster analysis as a tool for systematic scenario formation. *Technological Forecasting & Social Change,* 70(1), pp. 83-101.

TATA Strategic Management Group., (2013). Coastal shipping-The negleted mode of transportation. [Online] Available at: www.tsmg.com [Accessed 21 January 2014].

Tavallaei, M. and Talib, M. (2010). A General Perspective on Role of Theory in Qualitative Research. *The Journal of International Social Research*. 3 (11). pp 570- 577

Teignmouth Harbour Commission., (2014)., [Online]., Available at http://www.teignmouthharbour.com/., [Accessed 15th August 2014].

Toohey, M.J.,(2002). The waterways alternative. *JoC Week,* 3(24), p. 46.

Tonney., and Oliver, R, (2013). A Delphi approach to define learning outcomes and assessment. European Journal of Dental Education , Volume 17, pp. 173-180.

Tournaye, C. Pauli, G. Michael,S.D and Vander, W.H., (2010). Current issues of inland water transport in Europe. *Civil Engineering,* 163(5), pp. 19-28.

Trade Winds, (2009). *Global scan: Europe's inland shipping makes a splash,* s.l.: World Trade.

Trujilo, L. and Medda, F., (2010). Short sea shipping : an analysis of its determinants. *Maritime policy and management,* 37(3), pp. 285-303.

Turoff, M, (1970). The design of a Policy Delphi. *Technological Forecasting & Social Change,* Volume 2, pp. 149-171.

Turoff, M, (1975). The Policy Delphi. In: Linstone ,H. A. and . Turoff. M., ed. *The Delphi Method: Techniques and Applications.* Reading, MA: Addison-Wesley, pp. 84-100.

Turoff, M., and Linstone, H. A, (2002). *The Delphi method techniques and applications.* [Online] Available at: http://is.njit.edu/pubs/delphibook/delphibook.pdf [Accessed 14 June 2014].

Turro, S. a., 2013. Short sea shipping in Europe: Issues, policies and challenges. In: T. Finger. M and Holvad, ed. *Regulating transport in Europe.* Cheltenham: Edward Elgar, pp. 196-217.

Uhl, N. P, (1997). *Consensus and the Delphi process.* Washington, DC, ERIC Document ED 104201.

UNECE, (2011). *White paper on Efficient and Sustainable Inland Water Transport in Europe,* Geneva: United Nations Economic Commission for Europe.

US Army Corps of Engineers, (2014). *Inland waterway navigation value to the nation.* [Online] Available at: http://www.sas.usace.army.mil/Portals/61/docs/lakes/thurmond/navigate.pdf [Accessed 23 January 2014].

Valois, N.A.L., Medina, A.C., Botter, R.C., and Baird, A.J., (2011). *Short sea shipping in Brazil: Potential and policy implications.* Santiago de Chile, IAME 2011 Conference.

Vassalos, and Oestvik. (1999). *Strategic analysis of coastal and inland transportation.* London, RINA.

vonder Gracht, H. A, (2008). *The future of logistics: Scenarios for 2025,* Germany: Gabler Edition Wissenschaft.

vonder Gracht, H. A., and Darkow, I-L, (2010). Scenarios for the logistics service industry: A Delphi-based analysis for 2025. *International Journal of Production Economics,* Volume 127, pp. 46-59.

Wang. H., (2014)., *The end of the era of heavy fuel oil in maritime shipping* [Online] http://www.theicct.org/blogs/staff/end-era-heavy-fuel-oil-maritime-shipping [Accessed 27/06/2015]

.Webb, R.,(2004). *Coastal Shipping: an overview,* Australia: Department of Parliamentary Services.

Williams, P. L., and Webb, C, (1994). The Delphi technique: an adaptive research tool. *British Journal of Occupational Therapy,* 61(4), pp. 153-156.

Williams, R.G.A. (1981) 'Logical analysis as a qualitative method II: conflict of ideas and the topic of illness', *Sociology of health and illness*, 3 (2): 165-187

Winebrake, J., Corbett, J.J., Falzarano, A., Hawker, J.S., Korfmacher, K., Ketha, S., and Zilora, S., (2008). Assessing energy, environmental and economic tradeoffs in intermodal freight transportation. *Journal of the air and waste management association,* 58(8), pp. 1004-1013.

Woff, I., Toumbourou, J., Herlihy, E., Hamilton, M., and Wales, S, (1996). Service providers perceptions of substance use self-help groups. *Substance use and misuse,* 31(10), pp. 1241-1258.

WMRA., 2007. Regional Freight Strategy, Birmingham: West Midlands Regional Assembly.

Wood, G., (2004). Tanzanian coastal and inland ports and shipping: Crises and policy options. *Maritime policy and Management,* 31(2), pp. 157-171.

Yang, C.C., Tai, H.H., and Chu, W.H., (2013). Factors influencing container carriers use of coastal shipping. *Maritime policy and management,* 41(2), pp. 192-208.

Yassin, S. M., Shaffril, H. A.M., Hassan, M. S., Othman, M.S., Samah, A.A., and Samah, B. A., (2010). Prospects of Waterway Development as a Catalyst to improve Regional and community Socio-Economy Level. *American Journal of Economics and Business Administration,* 2(3), pp. 240-246.

Ziglio, E, (1996). The Delphi method and its contribution to decision-making. In: Z. E. Adler M, ed. *Gazing into the Oracle: the Delphi method and its application to social policy and public health.* London: Jessica Kingsley Publishers, pp. 3-33.

Zolingen,S. J., and Klaassen, C. A, (2003). Selection process in a Delphi study about key qualifications in senior secondary vocational education. *Technological Forecasting & Social Change,* 70(4), pp. 317-340.

Zou, B.,Smirti, M and Hansen, M., (2008). Reducing Freight Greenhouse Gas Emissions In The California Corridor: The potential of short sea shipping, UC Berkeley: University of California transportation centre.

Appendix A: A brief description of ports in CAD

Ports in Devon

EXMOUTH

Exmouth is a small tidal harbour, which in 1870 it lost its trade as a small commercial port. The Company was formed in 1988. Currently it has an inshore commercial fishery, with associated fish quay, a small boatyard, about 100 small craft moorings, marine services, diving and angling and ship repair facilities. The local Yacht Club is providing recreation water sports (SWRPA, 2011).

BIDEFORD

Bideford is a tidal port on the North Devon coast which imports and exports general cargoes mainly ball clay exported to Spain, Finland and the Netherlands, logs to the German Baltic and imports of rock salt. Cargo handled is averaging approximately 5700 tonnes per month. Bideford is also a minor ferry port. Having a shipyard at Appledore the Oldenburg Passenger Ferry to Lundy Island is based at Bideford. Vessels up to 3300 tonnes deadweight are regularly handled. A modern rehandler grab crane at the port helps to manage lifting duties. Main services at the port include bulk dry cargo and fishing (SWRPA, 2011).

BRIXHAM (Part of Torbay Harbours)

Brixham Harbour is one of the largest fishing ports in England with over 150 local boats. Brixham has deep water mooring facilities providing full coverage for fishing and leisure, boat lifting and slipway launching. The port provides 500 moorings for fishing boats, leisure craft and visiting vessels. Torbay Harbour Authority is the local authority of the port (SWRPA, 2011).

DARTMOUTH

Dartmouth, on the South Devon coast, supports a local crabbing fleet (which landed a catch worth over £1m in 2010). Dartmouth also has a licensed salmon and oyster fishery. Cruise liners and warships visit the harbour. Key services provided by the port are cruise ship facilities, fishing, marina, and moorings. There is a large number of leisure craft moorings (approximately 2700). South Hams District Council is working as the local authority of the port (SWRPA, 2011).

EXETER RIVER & CANAL

Harbour Authority for the tidal Exe Estuary and Exeter Ship Canal with activities consisting primarily of maintenance and operation of the Canal for commercial as well as recreational use for summer visitors and winter laying up of yachts. The City of Exeter is the navigation authority for the Exe Estuary and is the owners/operator of Topsham Public Quay for commercial and leisure use for winter lay ups and summer berths (SWRPA, 2011).

ILFRACOMBE

Ilfracombe is mainly involved with the leisure and tourist industry. Previously it was a small commercial port. It has over 100 leisure moorings for local residents, and space for visitors' craft. The passenger vessels Oldenburg, Waverley and Balmoral operate from Ilfracombe pier during the summer months. The inner harbour dries at low water. A small commercial fishing industry operates from a dedicated fish quay. North Devon District Council is the local authority of the port (SWRPA, 2011).

PAIGNTON (Part of Torbay Harbours)

Paignton Harbour, located on the South Devon coast, is part of Torbay Harbours. It is a drying harbour with leisure moorings. It provides facilities for Maritime events - i.e. Dinghy Championships, boat park, fishing, dinghy storage and slipway. Local authority of the port is Torbay Harbour Authority (SWRPA, 2011).

PLYMOUTH - ABP, Millbay Docks

Associated British Ports runs the Millbay docks. Principally it functions as a continental ferry port. Other activities of the port include cruise liner operations, general cargo facilities and the brand new King Point Marina provides berthing for some 171 boats within Millbay's inner basin (SWRPA, 2011).

PLYMOUTH - Cattewater

An Act of Parliament made the Cattewater Harbour Commissioners as the navigation and conservancy authority for the Cattewater Harbour. The harbour comprises three separate Commercial harbours; Millbay is primarily passenger ferries operated by Associated British Ports; Sutton Harbour is for fishing/ leisure; and the Cattewater Harbour is offering access to privately owned facilities for both commercial shipping and leisure craft. Major imports include refined clean oil products, agribulks, timber and specialist aggregates. Exports from Cattewater Harbour consist of primary/secondary aggregates, china clay, grains and scrap metal. There is also a large fish processing plant. The Cattewater Harbour, located at the eastern end of the City's waterfront, is well placed to handle vessels up to 150 metres in length. The pilot boat ('Maker'), an 18 tonne bollard pull tug ('Prince Rock'), a mooring maintenance barge and workboat ('Pronto') are operated by the respective departments. There are approximately 150 swinging/trot moorings for local residents and limited short-term visitors' moorings are also available (SWRPA, 2011).

PLYMOUTH - Sutton Harbour

This is a private port. Main activities include commercial fishing, marina (500 berths), land and property (landlords / developers) (SWRPA, 2011).

DEVONPORT ROYAL DOCKYARD

Devonport is the largest Naval Base in Western Europe. It has 15 dry docks, four miles of waterfront, 25 tidal berths and five basins. Since 1961 Devonport has

been supporting the Royal Navy. Every year Devonport handles approximately 5,000 naval vessel movements. It provides surface ship refitting facilities and is equipped to conduct nuclear submarine refits. Devonport Royal Dockyard (formerly owned by Devonport Management Limited) is now part of the Babcock Marine Division of the Babcock International Group PLC. Babcock offers all in-service engineering and support including: hull and systems; nuclear reactor and secondary propulsion lant; combat systems; stategic weapon systems; annual maintanence and refit load required to support operational fleet (Plymouth City Council, 2010).

SALCOMBE

The Salcombe Harbour Kingsbridge Estuary is four nautical miles of tidal waters, treated as a Marine Nature Reserve. It is one of the most beautiful sailing and fishing centres in the world. All water borne activities are available from Salcombe. It offers a safe haven to visiting yachts with a complete range of associated facilities. Apart from a sizeable shell fishing fleet, there is no commercial traffic. Yacht and small craft moorings are concentrated into certain dedicated areas, leaving a large proportion of the many creeks unspoilt as a natural habitat for the abundance of wildlife. Salcombe is a major centre for sailing with over 2,000 licensed resident moorings. South Hams District Council serves as the local authority (SWRPA, 2011).

TEIGNMOUTH

Teignmouth is both a commercial and a leisure port; run by Associated British Ports. Important commercial activity is the export of clay and the import of animal feed, fertiliser and other commodities. Pilotage is compulsory for vessels over 30m entering or leaving Teignmouth. There is a small and active group of fishing vessels based in the port. On the leisure front there are 120 deep water moorings plus 700 drying moorings and a number of visitor moorings managed by the Harbour Commission. Local authority of the port is Teignmouth Town Council (SWRPA, 2011).

TORQUAY (Part of Torbay Harbours)

There is only modest commercial activity at the harbour such as tugs and servicing ships at anchor. Leisure boating including 350 moorings, a large private marina and Council run pontoon moorings for locals and visitors. It is a significant venue for maritime events. There is only a small inshore fishing fleet. Other facilities available are cruise ship operations, boat lifting and dry-storage. Torbay Council – Harbour & Marine Services Business Unit works as the local authority (SWRPA, 2011).

Ports in Cornwall

BUDE

Bude Harbour has an inner section and seaward area protected by a breakwater. Main services provided by harbour are moorings for leisure and fishing. Access to the inner harbour is through a sea lock and upstream of the inner harbour is the Bude Canal (SWRPA, 2011).

FALMOUTH

One of the busy ports in Cornwall is Falmouth situated at the mouth of the Fal Estuary with a range of facilities catering for both commercial and leisure vessels. Major services provided from the harbour are oil terminals, bulk dry cargo, ship repair facilities, cruise ship facilities and moorings. The shipyard and three dry-docks are operated by A & P Falmouth. It has general cargo handling facilities. The oil tanks which store oil for offshore and inshore supply is operated by Falmouth Oil Services. World famous super yacht builders Pendennis Shipyard is also situated within the Docks. Cornwall Council is the local authority of the port (SWRPA, 2011).

FOWEY

The Port of Fowey, situated in the south coast of Cornwall, is largely engaged in the export of china clay. Annually it exports 1Mt making Fowey the largest

exporting port in the SW UK. Other activities of Fowey Harbour Commissioners comprise tug operation, including out of port towage services in other ports and vessel repair facilities. There are a large number of leisure craft moorings (1,600) and facilities for visitors, (7,500 visits 2010,) within the Harbour. Fowey is the Competent Harbour Authority for pilotage matters for the Ports of Fowey, Par and Charlestown (SWRPA, 2011).

HAYLE

Hayle is a tidal harbour; its main activities are commercial fishing and leisure (SWRPA, 2011).

LOOE

Fishing is the major activity at the Looe harbour which caters for a large home inshore trawler fleet. There are facilities for leisure moorings and visiting yachts (SWRPA, 2011).

MEVAGISSEY

Mevagissey Harbour, on the south coast of Cornwall, is a fishing harbour, which has excellent facilities for the fishing industry. At present 60 registered fishing vessels work from the harbour plus a similar number of pleasure boats. Mevagissey Harbour is registered as a Charity (SWRPA, 2011).

NEWLYN

Newlyn is a fishing harbour with a history of exported stone chippings. Newlyn is the second largest UK fishing port in the U.K. landing £19M of fish annually. Vessels sizes ranging from 19ft to 120ft operate from the Port. There are facilities for visiting yachts. Every year approximately 800 vessels visit Newlyn (SWRPA, 2011).

NEWQUAY

Newquay is a fishing and pleasure Harbour, operating seasonal activities and all year round fishing vessels. There are a small number of local moorings (63) and limited facilities for visiting yachts (SWRPA, 2011).

PADSTOW

Padstow, located on the North Cornish Coast, currently handles 60kt of general bulk cargo. It includes sand dredging, which takes place within the Estuary and is processed ashore for agricultural/industrial use. Other facilities at the port are fish quays, local ferry services and approximately 200 small craft moorings located within the Port (SWRPA, 2011).

PENRYN

Penryn Harbour is located to the west of the Fal Estuary from Coastlines Wharf to Islington Wharf. The harbour comprises approximately 100 acres. It has a working quay for fishing vessels, yacht marina, private moorings and a number of boat repair yards, boatyards and specialist marine services, including a small shipyard. There are approximately 350 moorings (SWRPA, 2011).

PENZANCE

Penzance offers commercial ship repairs from Penzance Dry Dock Ltd. Penwith Marine Services who operate a dry dock, as well as marine engineers. There are also facilities for 240 moorings and berths in the wet dock for up to 50 visiting yachts. The harbour has modest fish landings within the Port and the main cargo handled in the wet dock consists of supplies and freight to and from the Isles of Scilly. Other cargo recently handled includes stone for sea defence projects and heavy lifts for South Western Electricity (SWRPA, 2011).

ST. IVES

St Ives is principally a fishing port which is very busy from spring to autumn. It is a tidal harbour. Another service offered from the harbour is moorings (SWRPA, 2011).

TRURO

Truro is located on the south coast of Cornwall located around the upper half of the Fal Estuary. Commercial facilities include Lighterage Quay, Newham (1.5 km downstream of the city centre) which is 350m x 10m, this tidal berth offers a central inland location for Cornwall and the South West. The quay provides a facility of a 50 tonne weighbridge and fresh water. The Port transports general bulk and bagged cargo, palletised goods and other ‘one-off’ cargoes i.e. boat hulls, steel coils etc. Stevedoring, ships agency, pilotage and cargo storage (both open and covered) are all available locally. The King Harry Ferry has a number of deep water lay-up berths for large vessels. These moorings can accommodate vessels up to 190m Loa. A native oyster fishery also situated in the Port of Truro which is open from the 1 October to 31 March each year which only vessels fishing by traditional means may dredge (SWRPA, 2011).

Appendix B: Three rounds of the Delphi surveys responses and the expert panel members comments on eight consensus

Delphi Round 1 survey responses

Q1 The first question of the Delphi survey was intended to collect expert panel member's name, the company for whom they are working, current position, their specialist area of expertise and their country. In a total of 29 pre-agreed respondents 25 expert panel members were given all the requested data for further references.

Table 5.4 First Round Delphi expert panel members' representation

Respondents	Agreed	Actual participation	%
Industry experts (Logistics, Supply Chain and Shipping)	13	12	92.31
Academics	12	9	75
Researchers	2	2	100
Politicians	2	1	50
Total	29	24	83

Source: authors own

Q2 Do you believe the geography of the SW UK is suitable for extensive water freight movements in the region?

Answer choices	No of responses	%
Agree	14	58.33
Disagree	8	33.33
Unable to comment	2	8.33
Total	24	100

Q3 Do you think water freight in the SW UK can support transfer of road freight movements to water?

Answer Choices	No of responses	%
Agree	11	45.83
Disagree	11	45.83
Unable to comment	2	8.33
Total	24	100

Q4 Do you agree that logistics professionals and freight forwarders are fully aware of the potential of water freight in CAD?

Answer choices	No of responses	%
Agree	4	16.67
Disagree	13	54.17
Unable to comment	7	29.17
Total	24	100

Q5 Do you believe by using water freight, the cost of transportation can be reduced significantly compared to road transport?

Answer choices	No of responses	%
Agree	15	62.50
Disagree	5	20.83
Unable to comment	4	16.67
Total	24	100

Q6 Do you believe an increase in water transportation will reduce the negative impacts on the environment and external costs caused by road transportation and increase sustainability?

Answer choices	No of responses	%
Agree	19	79.17
Disagree	2	8.33
Unable to comment	3	12.50
Total	24	100

Q7 Do you think integrating water freight into intermodal transportation will result in just in time and door to door delivery of goods?

Answer choices	No of responses	%
Agree	10	41.67
Disagree	12	50.00
Unable to comment	2	8.33
Total	24	100

Q8 Do you believe the potential of water freight as a mode of transport is fully utilized in CAD?

Answer choices	No of responses	%
Agree	2	8.33
Disagree	18	75.00
Unable to comment	4	16.67
Total	24	100

Q9 Do you think water freight in CAD is facing problems to utilize its full potential?

Answer choices	No of responses	%
Agree	17	70.83
Disagree	3	12.50
Unable to comment	4	16.67
Total	24	100

Q10 Do you believe complete integration of water freight in the logistics chain is difficult?

Answer choices	No of responses	%
Agree	19	79.17
Disagree	3	12.50
Unable to comment	2	8.33
Total	24	100

Q11 Do you think water freight in CAD would perform better if it had sufficient trained crew and opportunities for continuous training on technological advancement?

Answer choices	No of responses	%
Agree	3	12.50
Disagree	15	62.50
Unable to comment	6	25.00
Total	24	100

Q12 Do you think there is a lack of sufficient infrastructure and facilities at the ports in CAD to handle more commercial activities?

Answer choices	No of responses	%
Agree	12	50
Disagree	7	29.17
Unable to comment	5	20.83
Total	24	100

Q13 Do you think the complex administrative process of water transportation is having a negative effect on the development of water freight in CAD?

Answer choices	No of responses	%
Agree	9	37.50
Disagree	7	29.17
Unable to comment	8	33.33
Total	24	100

Q14 Do you believe the growth of water freight in CAD is negatively affected by insufficient government incentives and inadequate promotion by the Department of Transport?

Answer choices	No of responses	%
Agree	15	62.50
Disagree	4	16.67
Unable to comment	5	20.83
Total	24	100

Q15 Do you think water freight is a sustainable green alternative to road and rail?

Answer choice	No of responses	%
Agree	21	87.50
Disagree	1	4.17
Unable to comment	2	8.33
Total	24	100

Q16 Do you think firms and society in CAD would benefit more from the usage of water freight in terms of competitive cost, integration across all regions, economic progress, overland congestion, added security, agility in customer delivery, compared to road transport?

Answer choices	No of responses	%
Agree	11	45.83
Disagree	7	29.17
Unable to comment	6	25
Total	24	100

Q17 Do you think water freight is more labour, energy and fuel efficient than road transport?

Answer choices	No of responses	%
Agree	18	78.26
Disagree	3	13.04
Unable to comment	2	8.70
Total	23	100

Q18 Do you believe water freight is potentially a more important source of revenue and employment which can lead to the economic growth and prosperity of CAD compared to road transport?

Answer choices	No of responses	%
Agree	9	39.13
Disagree	7	30.43
Unable to comment	7	30.43
Total	23	100

Q19 Please give your suggestions for developing water freight as an efficient and sustainable mode of transport in CAD

A total of 23 expert panel members have given their ideas for this question. Their suggestions include demand for government incentives and subsidy, European grants, better infrastructure; improve port links, proper marketing of water freight and assessment of volume of freight which could be transported around/within the region in order to identify water alternatives and suitable routes possible with current and future infrastructure.

Table 5.5 Explanations of the expert panel members for statement six in the first Round of the Delphi survey

1	"Do you believe an increase in water transportation will reduce the negative impacts on the environment and external costs caused by road transportation – Yes and increase sustainability? - Not sure what this means but if it is cheaper which it is then freight by water will increase"
2	Carbon cost of moving freight on the water is considerably lower than by other transport medium and I believe this is sufficiently documented. Cleaner fuel requirements will further reduce this impact but may be more expensive
3	Yes - in the long term this would be the case

4	Traffic growth will inevitably increase road congestion going forward. Water use could mitigate this, but economic incentives will be required
5	This assumption cannot be made in such generic terms, even though it seems plausible. An increase in water transportation only reduce negative environmental impacts if the logistics infrastructures are located near the departure and arrival points, and if the shipping route is short enough, compared to the road route.
6	This is what the public are requiring, and legislation is considered to highlight these issues
7	The statement speaks for itself
8	There is definitely the potential for a huge reduction in road transport miles if transhipment costs can be minimised
9	Definitely
10	Fuel per kg mile
11	There would be less traffic on the roads and ships are likely to be more environmentally friendly than lorries, along with being able to transport more cargo per journey making it more efficient overall. Less lorries on the roads would contribute positively to things such as potholes, wear and tear damage etc., equally congestion due to broken down lorries/lorries that essentially need crawler lanes, that don't exist, thus saving the country money. Ships have a longer lifespan than lorries too, which means less materials are needed initially and therefore it contributes to the environment in a less negative way, as well as saving money in fewer repair and maintenance costs.
12	"No since road will still be needed for part of the journey. Better to look at implementing rail use."
13	Inevitably. Less accidents, less pollution, less congestion. Need good access to ports however.

14	Fewer road vehicle movements over long distances have shown such benefits elsewhere.
15	Carbon foot print of water freight far less than road haulage.
16	The benefits, in terms of sustainability, of water freight transport as against road (and to a lesser extent rail) and well known and understood. Clearly where the transport networks are less well developed, which is certainly the case in Cornwall, then the advantages will be more manifest.
17	There is also a reduced hidden cost factor in the reduction of road congestion to be taken into account, which also has environmental implications. Fuel consumption and hence carbon emissions are far lower per ton of freight moved by sea than by any other transport means.
18	While this holds true for road transportation links there will of course be some offset because of the increase of these impacts on the marine environment
19	"Again, this depends on context. Along the coast water transport would reduce the impacts of road transportation by potentially taking lorries off the roads. However, there is an issue with the quality of marine diesel fuel compared to ordinary diesel - marine diesel is generally more polluting in terms of sulphur content, for example. The ability to carry much greater volumes of cargo could result in fewer vessel movements, however, offsetting the emissions issue. The question would still need to be asked whether it is possible to offset the impacts of road transportation against increased emissions potentially entering the marine environment - issues like pollution from ships (accidental or intentional) - and also the increased congestion of an already heavily used waterway - the English Channel. On balance, maritime transport would appear to be the better option, but it has to be considered in the

	wider context of the region being used for multiple purposes including fisheries, aquaculture, wind and wave renewable energy generation etc."
20	No comment
21	Emissions from very small ships are exponentially higher than big ones - but exactly how polluting is not known... efficient use of road may be less polluting

Table 5.6 Explanations of the expert panel members for statement 10 in the first Round of the Delphi survey

1	Yes because of ignorance of what is involved
2	It is not difficult to do in terms of actually carrying the goods. It may require a shift in culture and practices to make it happen. There would need to be a 'will' to make it happen and I am not sure this shift in mind set would be easy. The is likely to be some or a lot of resistance to the shift. There may need to be a significant investment in some ports and in particular, the road links to these ports
3	Short sea services are prone to disruption by weather - this could interrupt the logistics chain and would have to be allowed for in planning an integrated activity
4	Special characteristics include additional handling and lack of speed and reliability.
5	Yes, due to the aspects enumerated before: the network of multimodal infrastructures has to be dense (which is costly), the frequency of service has to be high (which also difficult to reach with small volumes),

	and the speed can be a problem too, when compared to a 100% road route.
6	In the UK this is particularly significant. Wherever there is a port on the South Coast there is no inland waterway. This is limited on the East Coast. Canal usage is possible, but mindsets are difficult to change.
7	see previous answer
8	Yes - as all previous answers, however can you imagine the world without containerization? the benefits are just the same on a smaller scale for local shipping, and increase as fuel costs increase
9	In logistics of Cornwall and Devon - yes. See Q9
10	A9
11	Again, funding would be a large issue, initially, because lots of logistics chains would have to alter, however once the changeover was complete I think it would be a better system. In addition to this, enough specialists in the field would be required to assist companies in moving towards a more water freight based logistics chain, which highlights the lack of suitably qualified candidates in the sector.
12	It is easy in the right conditions, good freight volumes to justify investment, large population areas and berths close to the need to minimize transshipments. Also there are a lot of good working models in Europe to follow in the right economic conditions.

13	Because it always involves more modal change. It has a lower profile than road transport. And there is bias in the system.
14	It is difficult, but not unachievable.
15	The aforementioned issue of terms of sale and purchase is a major complicating feature. The quantities of traffic moving in and out of the area internationally would require the integration of traffics that currently pass through many different shipping services through many different hub ports. It also requires us to obtain statistics of tonnages moving, both in total and destination by destination. (Same in reverse for imports.)
16	It depends what you mean by 'complete'. There is 'complete' integration to the extent that 90% of all goods by volume to/from the UK come in a vessel. From there on, the integration is less complete...
17	See previous answer
18	Intermodal logistics chains require considerable planning, and if you are to integrate water freight through ports in CAD, there is the potential for local protests about not only increasing number of cargo vessels using ports but increasing numbers of lorries using the roads around those ports. Rail transport links would need to be upgraded and improved to reduce journey times, and there may be a need for new rail lines for freight, although the discussion following the damage to the rail line at Dawlish suggested that alternative routes or increased train numbers is likely to be problematic.
19	No comments

20	Physical infrastructure tends to be inflexible, and demands change rapidly, so time required to build it and switch are prohibitive

Table 5.7 Explanations of the expert panel members for statement 15 in the first Round of the Delphi survey

1	I don't think that there is any doubt here
2	No need to maintain a ‘way’ opportunities to use innovative propulsion methods including wind efficiencies in use of fuel/unit carried are advantageous over road and rail 500+ containers can be moved by one vehicle
3	There are good examples of road and rail activity being reduced where the economics work
4	Yes, in general, but only the access to multimodal infrastructures is near enough to the departure and arrival points. (I could have answered unable to comment)
5	Sea Freight is more green and economical
6	The statement speaks for itself.
7	in terms of fuel per tons it must be, but the means of transport needs to be considered to be closer to a lorry than to a deep-sea vessel and regulations framed accordingly
8	Yes, definitely. Rail infrastructure is expensive to maintain, as locomotives and rails needs to be changed after a certain amount of

	mileage. Water is heavy and travelling over rail will increase depreciation of the rail tracks. Sea water is free and doesn't need maintenance
9	Fuel efficiency due to economies of scale
10	Although not 100% green, improvements in shipping sustainability are moving much faster than those in road and rail, as well as having a lesser output per unit because of the capability to carry more goods, therefore, water freight is definitely moving in the right direction and currently is a better alternative, environmentally, than road or rail.
11	Yes, in the right location with the correct economic factors to support it.
12	To a certain extent. It is not perfect but better than road. Rail is better again.
13	Consider economies of scale.
14	It is a sustainable alternative to road and rail, but clearly not in every case. Each traffic flow must be judged on its own merits
15	Rail less so
16	The BPA have long advocated this and have the evidence to show that marine freight is 'greener' than road transport
17	Yes, it can be, but it needs to be very carefully planned around things like the marine protected areas and other marine activities so that it does not harm the marine environment. The benefits of reduced road and rail

	transport should not be outweighed by harm to the coastal and estuarine areas.
18	Not sure how use of fuel compares
19	Not in very small ships - it may be more polluting than road and much more than rail. For large bulk movements, none of which exist in the SW, water wins.

Table 5.8 Explanations of the expert panel members for statement 17 in the first Round of the Delphi survey

1	particularly for movement of large amounts particularly of bulk for small parcels then less so particularly for relatively short journeys
2	Already referred to.
3	Benefits very apparent for larger volumes
4	Yes, but only with the condition that the multimodal logistic route is not too long compared to the direct, road route.
5	Economy of scale.
6	With the current system the saving in fuel per tons is offset by the cost/resource use of transshipment. If the system was optimized, then water freight must be the winner

7	No - It is more labour intensive because it involved more parties - hence higher costs. Energy and fuel - I think yes.
8	See above
9	Predominantly the energy and fuel needed by vessels is less, particularly if considered on a per unit basis, however labour costs might be higher. Ship's crews have to be qualified and can demand higher wages than lorry drivers, additionally, several are needed on each vessel, although if more than one lorry's amount of cargo is being transported this could easily equal out. The repair of ships is more expensive than lorries but is less regularly needed.
10	Yes, over long point to point distances. However once transhipment takes place and utilising other rmodes for collection and delivery then thid advantage may well disappear
11	Depends on commodity and remember all water transport needs road connections.
12	Evidence support this
13	Studies comparing the fuel efficiency of different transport modes consistently display evidence that road is the least efficient per ton carried. Rail is better than road freight, but marine freight is the most fuel and labour efficient.
14	The statistics back it up.
15	More freight can be transported on a single large ship than by a large number of lorries or trains. Therefore, by volume, it is likely that water freight will be more energy/fuel efficient. Modern ships can also sail with only a small number of crew on board.
16	No comment
17	A large scale yes, at very small no

Delphi Round 2 survey responses

Q1 The first question was intended to confirm the respondents' identities in order to contact them if they were unable to complete the second round of the Delphi survey within the stated time period.

Table 5.9 Second Round Delphi expert panel members' representation

Respondents	Agreed	Participated in the 1st round	Participated in the 2nd round	%
Industry experts (Logistics, Supply chain and Shipping)	13	12	11	84.61
Academics	12	9	9	75
Researchers	2	2	2	100
Politicians	2	1	1	50
Total	29	24	23	79.31

Q2 Do you believe the presence of extensive coastline and accessibility to a number of ports along the length of the SW UK coast are supportive for water freight movements in the region?

Answer choices	No of responses	%
Agree	18	78.26
Disagree	4	17.39
Unable to comment	1	4.35
Total	23	100

Q3 Do you think with the help of improved resources; water freight in the SW UK can support transfer of road freight movements to water?

Answer	No of responses	%
Agree	17	73.91
Disagree	2	8.70
Unable to comment	4	17.39
Total	23	100

Q4 Do you agree that logistics professionals and freight forwarders need more information about the potential of water freight in CAD?

Answer choices	No of responses	%
Agree	17	73.91
Disagree	2	8.70
Unable to comment	4	17.39
Total	23	100

Q5 Do you believe by using water freight, the cost of transportation can be reduced significantly for transporting bulk products long distance compared to road transport?

Answer choices	No of responses	%
Agree	19	82.61
Disagree	2	8.70
Unable to comment	2	8.70
Total	23	100

Q6 Do you think integrating water freight into intermodal transportation will help, just in time and door to door delivery of time not sensitive goods?

Answer choices	No of responses	%
Agree	9	39.13
Disagree	9	39.13
Unable to comment	5	21.74
Total	23	100

Q7 Do you believe the potential of water freight as a mode of transport is under-utilized in CAD?

Answer choices	No of responses	%
Agree	17	73.91
Disagree	1	4.35
Unable to comment	5	21.74
Total	23	100

Q8 Do you think water freight in CAD has to overcome many difficulties to operate to its full potential?

Answer choices	No of responses	%
Agree	16	69.57
Disagree	2	8.70
Unable to comment	5	21.74
Total	23	100

Q9 Do you think water freight in CAD would perform better if it has sufficient trained logisticians and freight forwarders in water freight?

Answer choices	No of responses	%
Agree	8	34.78
Disagree	6	26.09
Unable to comment	9	39.13
Total	23	100

Q10 Do you think there is a lack of sufficient facilities and hinterland connections at the ports in CAD to handle more commercial activities?

Answer choices	No of responses	%
Agree	12	52.17
Disagree	5	21.74
Unable to comment	6	26.09
Total	23	100

Q11 Do you think by streamlining and standardising complexity of port entry requirements of water transportation will have a positive effect on the development of water freight in CAD?

Answer choices	No of respondents	%
Agree	12	52.17
Disagree	5	21.74
Unable to comment	6	26.09
Total	23	100

Q12 Do you believe the growth of water freight in CAD is negatively affected by the limited interest of the government and Department of Transport?

Answer choices	No of respondents	%
Agree	14	60.87
Disagree	5	21.74
Unable to comment	4	17.39
Total	23	100

Q13 Do you think the usage of water freight can produce short-term and long-term benefits such as sustainability, reduction in overland congestion, competitive cost, integration across all regions, and economic progress, compared to road transport?

Answer choices	No of respondents	%
Agree	20	86.96
Disagree	2	8.70
Unable to comment	1	4.35
Total	23	100

Q14 Do you believe if water freight is offered as an efficient and well-planned alternative to road and rail transport it can lead to the economic growth and prosperity of CAD?

Answer choices	No of respondents	%
Agree	16	69.57
Disagree	5	21.74

Unable to comment	2	8.70
Total	23	100

Q15 Do you have any suggestions for developing water freight as an efficient and sustainable mode of transport in CAD?

A total of 14 expert panel members have given their ideas for this question. Their suggestions include a collaborative partnership between all ports capable and willing to receive extra cargo, consider a provision for a feeder port, a market survey of the major importers and exporters of manufactured goods is required to have a full and proper understanding of what freight actually moves in the area and what can support that freight and its logistical needs, start a conversation about the relative total costs/benefits of water vs road transport, and the Maritime & Waterborne Innovation Group should be developed as an organisation to work for the development of water freight and co-ordinate all activities in the region.

Table 5.10 Explanations of the expert panel members for statement two in the second Round of the Delphi survey

1	With an expansive coastline we should be utilizing this more effectively and taking freight off the roads.
2	The vessel size would be restricted because many of the ports, like Bideford, are not particularly large, but I think the coast itself could be suitable.
3	Too far from distribution hubs and customer base.
4	There are a considerable number of small ports that with the right support would be able to support such a transition.

5	Yes, lots of ports. Shippers just need to use the ports.
6	It is beneficial to have final origins and/or destinations near port infrastructures in order to optimize costs for a specific number of products (especially bulks).
7	Historic use of ports was far greater than it is today. Small coastal vessels used an extensive number of harbours and beaches because of poor road connections. There is a need to return to this to relieve road congestion and greenhouse gas emissions
8	Few ports have required draught to support large vessels, even on high tide. Investment is needed into port infrastructure to enable higher commercial throughput
9	To be honest this is a combination really. The long/ relatively narrow region with sea on no and south coast plus a number of strategically spaced ports particularly on the south coast would support water freight movements. The road infrastructure especially in summer with delays would likely also aid in pushing some freight to the water, perhaps especially useful for some bulk freights (china clay already happens, cement, scrap aggregates etc. However, the natural reluctance for smaller shippers and the fact that onward transport to and from the ports would still be necessary would be a barrier. I suspect most of the industry in the region is smaller scale necessitating container size or less (pallet sized shipments to multiple destinations). Road/ rail links to some ports might also be a barrier. The tourist industry would be competing for the road and rail links
10	Limited possibilities at the 'larger' ports

11	An extensive coastline is irrelevant if it is hostile. Accessibility of ports depends on size of intended vessel, equipment available to handle cargo and infrastructure like road and rail to move cargo on. I do not believe that these criteria are achieved. Certainly, the population contained by this extensive coastline and served by these ports is insufficient to be cost effective for water freight movements.
12	It is an essential pre-requisite for short sea shipping but will not mean that such movements are economically viable.
13	Relative distances and poor land based infrastructure
14	Any option which relieves the road network is of value and gives some resilience to the system
15	The ports today have little infrastructure. From Bristol down to lands' end there are very few ports, and some are too small for today's vessels. Nothing major with the tide range on the north coast. Along the south coast there are some better ports with facilities.
16	Particularly in the South West, with land transport links (road and rail) being not necessarily of a high standard, the use of water-borne freight to move goods along the coast and inland would take freight off the land which would reduce congestion on land. Although it might be necessary to improve links from ports to the hinterland, this should be feasible in the longer term.
17	Yes, but the relatively small size of harbors and hinterland infrastructure will limit the volumes per vessel and hence the commercial viability of such

	traffic. Furthermore, the relatively slow speed (compared to lorries/vans) may also be a disadvantage.
18	Whilst it would appear natural that extensive coastline and a number of ports (although whether these are accessible to vessels is another matter), together with underdeveloped road and rail infrastructure, would make for a supportive environment for the movement of freight in the region, I am not sufficiently well informed on the local circumstances (which are of paramount importance) to comment further.
19	Ports are the key; length of coastline is irrelevant. Any move to water freight must depend on an interface between (relatively) deep water and the road and/or rail system. Therefore, the minimum requirement is for basic quay space with road access. In the SW there are basic port facilities available every 20 miles or so (many would require improving)
20	Lots of good natural harbors. Plenty of port development already which could be extended and improved.

Table 5.11 Explanations of the expert panel members for statement five in the second Round of the Delphi survey

1	Yes, this is an obvious economy of transport offered by sea freight
2	Theoretically it would be, particularly because road links in CAD are poor, but in practice it might take a significant time period to recoup initial costs.
3	Bulk transport to destinations close to customer base must to be more economical than breaking bulk and onward transport.

4	Simple economies of scale have proven the effectiveness of reducing cost.
5	Bulk products can be much cheaper shipped by water, but economy of scale require 1500 tons plus to be shipped at a time.
6	It is usually the case.
7	In fact, long distance bulk cargoes are the one area of maritime transport that is still used. The problem stems more around the transport of LCL traffic.
8	Same as q4 - ONLY with economies of scale!
9	This has to be a given for bulk transport. Costs both economically and environmentally would be reduced. There is sufficient information about cost of transport by ship versus transport by road. Likely to depend on how large a parcel can be achieved and whether the correct sized vessels are available. I believe shipping of cement to Truro was affected by non-availability of sufficiently small vessels capable of shipping cement.
10	Depends on quantity and type of bulk products to be moved. Commodities - china clay and agri-bulks already make use of coastal shipping
11	No, not in CAD.
12	Distribution will require road transport at some point. Any savings will be offset by double handling requirements. Margins will increase with distance but unlikely to produce significant cost reductions in most cases.
13	As 2

14	I don't know enough about current costing and what would be the impact on them.
15	Off course. This is the principle of economy of scale
16	Ships are able to carry much larger cargoes than road transport. While the time taken to transport goods may be longer, economies of scale in terms of volumes carried should more than make up for any potential delays. Mixed cargoes, where a container is loaded with a number of different cargoes and is then split down in ports, is ready common practice in some ports.
17	That the actual transport is cheaper, is indisputable- the cost per tm is much less, BUT when you have to transship at each end of the sea leg from and to road vehicles then the benefits begin to evaporate, So...1/transship ship to ship or ship/quay/ship for imported commodities 2/ Site industry which uses bulk products in port areas, using zoning/planning/subsidy levers
18	Partially agree, but only between larger ports and for non-time-essential cargos
19	Because that's the case elsewhere! Bulk products in particular are well suited to water transport.
20	Long distance yes. It can help a great deal but only for bulk commodities.
21	Depends on load size

Table 5.12 Explanations of the expert panel members for statement 13 in the second Round of the Delphi survey

1	I think in the long-term it would, but I think the initial investment would be large, renovating ports, purchasing vessels, planning routes, strengthening inland links etc. meaning it is unlikely to reduce costs initially.
2	The question answers itself
3	Yes. However, the ideal way to make this simulation would be to consider a full cost accounting approach, including the reduction in terms of cost of congestion, of health impacts, etc. for each tax mile out of the roads.
4	In general, this is potentially clearly true, though it needs to be demonstrated that competitive costs can be obtained from the use of sea transport. Hence the need for study of how to bring this about.
5	It can deliver those benefits, but most likely it will be more expensive and will not be implemented until one can take advantage of the economies of scale
6	All of the above
7	carbon footprint of ship in terms of tonnes/ mile moved are significantly better removing traffic from the roads has to be a benefit however there will still be transportation from and to the port
8	Very much so If carbon taxes were imposed on road transport - this would provide an economic incentive for an alternative, more sustainable waterborne system of transport.

	Transport of containers by lorry to/from the principal UK hubs requires movement through congested areas - egg from London Gateway to CAD -the road route is by way of the M25 which is notorious for congestion.
9	Yes, generally, but not in this area. If you were to survey what is moving on the roads of CAD, then I believe you would find very little that would be reasonably and effectively transferable to water freight.
10	There are long term benefits particularly around road congestion but these are unlikely to be realized without incentives
11	Broader range of options undoubtedly offers potential benefits
12	If this was achievable.
13	I think water freight could generate all of these benefits, although depending on how much investment there needs to be to achieve the necessary infrastructure requirements, this may be in the longer term rather than the shorter term.
14	I think the short term will require much investment for small returns- but long term savings both financial and environmental should be so obvious, and in fact will be essential to meet future transport needs and combat environmental issues like global warming
15	Potentially
16	The statistics seem to indicate this the case...
17	Definitely.
18	Just because it can doesn't mean it will

Delphi Round 3 survey responses

Q1 The first question was intended to confirm the respondents' identities in order to contact them if they were unable to complete second round of the Delphi survey within the stated time period.

Table 5.14 Third Round Delphi expert panel members' representation

Respondents	Agreed	Participated in the 1st round	Participated in the 2nd round	Participated in the 3rd round	%
Industry experts (Logistics, Supply chain and Shipping)	13	12	11	11	84.61
Academics	12	9	9	8	66.7
Researchers	2	2	2	2	100
Politicians	2	1	1	1	50
Total	29	24	23	22	75.86

Q2 Do you believe the potential of water freight as a mode of transport is very under-utilized in CAD?

Answer choices	No of responses	%
Agree	14	63.64
Disagree	6	27.27
Unable to comment	2	9.09
Total	22	100

Q3 Do you think with improved port infrastructure, subsidies and investments for making essential facilities, water freight in the SW UK can support transfer of road freight movements to water?

Answer choices	No of responses	%
Agree	15	68.18
Disagree	3	13.64
Unable to comment	4	18.18
Total	22	100

Q4 Do you believe water freight in CAD is facing many issues in its day to day operations due to insufficient infrastructure at the ports and poor hinterland connections?

Answer choices	No of responses	%
Agree	13	59.09
\Disagree	5	22.73
Unable to comment	4	18.18
Total	22	100

Q5 Do you think logisticians, freight forwarders and other officials related to the water freight movements in CAD have to work for the betterment of the water freight industry in the region?

Answer choices	No of responses	%
Agree	16	72.73
Disagree	2	9.09
Unable to comment	4	18.18
Total	22	100

Q6 Do you think logisticians and freight forwarders can provide better knowledge about the potential of the water freight in CAD and demonstrate the market more clearly to its stakeholders?

Answer choices	No of responses	%
Agree	13	59.09
Disagree	3	13.64
Unable to comment	6	27.27
Total	22	100

Q7 Do you think due to lack of investments in port infrastructure, poor road and rail network connections to hinterland block the development of water freight in CAD?

Answer choices	No of responses	%
Agree	17	77.27
Disagree	2	9.09
Unable to comment	3	13.64
Total	22	100

Q8 Do you think different levels of regulation (International, EU, National, Regional) and port costs will have a negative impact on the growth of water freight in CAD?

Answer choices	No of responses	%
Agree	8	36.36
Disagree	9	40.91
Unable to comment	5	22.73
Total	22	100

Q9 Do you agree that the government and the Department of Transport have the responsibility to develop innovative ideas and offer more financial support to maximise the use of small and medium sized ports in CAD?

Answer choices	No of responses	%
Agree	14	63.64
Disagree	5	22.73
Unable to comment	3	13.64
Total	22	100

Q10 Do you think if the ports with sufficient infrastructure and hinterland connections, integrating water freight in to intermodal transportation will support just in time and door to door delivery of 'time not crucial small batches of cargoes'?

Answer choices	No of responses	%
Agree	10	45.45
Disagree	4	18.18
Unable to comment	8	36.36
Total	22	100

Q11Do you believe if water freight is offered as an alternative to road transport with sufficient port infrastructure and hinterland connections it will be beneficial to the economy of CAD?

Answer choices	No of respondents	%
Agree	16	72.73
Disagree	3	13.64
Unable to comment	3	13.64
Total	22	100

Table 5.15 Explanations of the expert panel members for statement seven in the third Round of the Delphi survey

1	All the important ports have appropriate hinterland connections.
2	Investment in port infrastructure is dependent on freight throughput to pay for it, and freight throughput is dependent on the ability of the port and its infrastructure to service. a bit of a chicken and egg situation. Currently I doubt the demand would support a lot if investment except in some specific cases
3	Can the cost now be justified?
4	I would suggest that better road and rail connections will be likely to decrease the need for water freight in this region.
5	port infrastructure however is good all the others are not
6	The geography of CAD means that the hinterland is necessarily restricted. Water freight is already connected to Southampton on the South coast and Bristol on the North, so water freight is competing with HGV road transport from these points. Local road networks are sufficient, better inter regional roads actually act against water freight by reducing journey times by HGVs. Better port infrastructure would follow if necessary when a local water freight system was established- in fact it would be good if simple bare quays could be utilised as there are many such quays still in existence allowing very local delivery points
7	Yes... Without these the development of water freight is not possible.
8	So, I read in a few reports, but I can't confirm by myself, so I prefer to select 'unable to comment'
9	Investment in port infrastructure will follow improved links and viable markets.

10	Although I am unable to comment in relation to the particular circumstances, my experience elsewhere is that no investment in infrastructure = no development of water freight.
11	Rail infrastructure needs improving
12	D & Crwl are very poorly served by landside infrastructure
13	I am not sure how much investment has been planned in these areas, particularly following the rail closure at Dawlish after the Winter 2013/14 storms. This has clearly led to much increased investment in the rail network in that area, and to consideration of alternative routes. An overview of transport network blockages, and the costs of overcoming them, together with the costs of alternatives such as short sea shipping and water freight transport is needed to provide a clearer picture of the costs involved in improving port infrastructure compared to the investment needed in the road and rail networks.
14	Roads and rail links are still very poor in the region and do not help.
15	Yes, there is recognition that the hinterland is limited in its depth. Both rail and road tend to align themselves East West. Both road and rail have limits imposed eg rail has weight limits between Cornwall and Devon (Brunel's Bridge). There is no motor way west of Exeter.
16	This is reflected in an earlier answer and almost identical question
17	Rail and road access is pitiful. Must hamper water links.
18	The 2 counties are 'forgotten' by the decision makers in government
19	Yes, but this is only part of the problem. Small individual consignments from micro-businesses do not currently lend themselves to developing waterborne transport, and this is made more complicated by the multiplicity of terms of sale, which dilute what cargos there are into many different decision-makers globally.

Appendix C: Discussions of statements which achieved consensus of between 50% and 70% and the statements which failed to achieve consensus beyond 50% in the Delphi study

6.4.6 Statements which achieved consensus of between 50% and 70% in the Delphi study

The third round of the Delphi survey has achieved five consensuses between 50% and 70% amongst the expert panel members. Though these statements could not attain consensuses at 75%, still the information collected on each statement will help to understand the importance of various factors mentioned in the statements in developing water freight in CAD. The five statements were; a) 'Do you believe the potential of water freight as a mode of transport is very under-utilized in CAD?' (63.64%); b) 'Do you think that with improved port infrastructure, subsidies and investments for making essential facilities water freight in the SW UK can support transfer of road freight movements to water?' (68.18%); c) 'Do you believe water freight in CAD is facing many issues in its day to day operations due to insufficient infrastructure at the ports and poor hinterland connections?' (59.09%); d) 'Do you think logisticians and freight forwarders can provide better knowledge about the potential of water freight in CAD and demonstrate the market more clearly to its stakeholders?' (59.09%); e) 'Do you agree that the government and the Department of Transport have the responsibility to develop innovative ideas and offer more financial support to maximise the use of small and medium sized ports in CAD?' (63.64%). A comprehensive analysis of each statement is given below.

Do you believe the potential of water freight as a mode of transport is very under-utilized in CAD? (63.64%)

As explained before the lack of sufficient infrastructure at the ports and hinterland connectivity are the main reasons behind the under-utilization of water freight in CAD. Compared to other parts of the UK market demand for water freight is low in the region. However, water transportation could be a useful means of transport for non-time critical freight. It can be used for the transportation of both low and

high value of low volume or high volume cargoes. By developing a small container system, shipping of low volume cargoes will come to a reality. At present with the available port facilities freight could be transported to larger ports and from there cargoes can be broken into smaller loads and then transported to smaller ports on general or small cargo ships. According to the facilities and hinterland connectivity some of the ports in the region can be functioned as coastal and short sea shipping hubs. Such an initiative could bring more business to ports. Also, this will support for shorter transportation by road and rail to the final destination. Thus, by transferring non-time-sensitive cargoes to water freight, road and rail congestion would be eased. In order to make use of the possibilities of water transportation in CAD a purposeful effort should be taken to understand the benefits that water freight offers to society and environment by the industry and the governing bodies. As a fast moving business, the logistics industry always gives importance to make profit through doing business. To become more successful in business the industry needs support and encouragement from society. Since water freight provides many advantages to society and the environment such as less pollution, reduced congestion, insignificant noise disruptions, negligible accidents rates etc. opting it for the transportation of high volume cargoes will give better goodwill to the industry. It is a greener way to transport goods in the shipping, logistics and supply chain industry. As a future transportation mode water freight could bring healthier environments and thus helps the industry to serve people with more genuine interest.

Do you think with improved port infrastructure, subsidies and investments for making essential facilities water freight in the SW UK can support transfer of road freight movements to water? (68.18%)

As per the opinions of the expert panel members with improved port infrastructure and government assistance in the form of investments and subsidies for improving the present status of water transportation could support transfer of road freight movements to water. Certain issues need special attention before building successful water freight movement in the region. There are many small ports

around the coast of SW UK that require some investments for making essential facilities to promote more water transportation in the area. More than expensive facilities the region requires a simpler means of handling cargoes to utilize the full potential of small ports. However, if there are sufficient facilities to conduct water transport, road transport will be used for endpoint delivery and collection which will add extra cost due to costs of double handling. To overcome this extra mode transfer cost, subsidies and other forms of financial aids will be necessary. The regularity and frequency of water transportation are important factors in deciding the mode of transportation among the potential customers. Identifying the customer segment which is most suitable to water freight is important. By selecting the particular customer sector, the industry can create necessary facilities and adjustments to meet customers' demand rather than spending time and money on enticing the entire freight market to water freight. According to the demand market of CAD the potential customer segment includes non-time-sensitive bulk high and low volume cargoes. Many small industries in the region demands distribution with the ability to handle parcels, pallets and less than container or truck loads. In this situation an effort to develop small container system according to the market demand for cargoes could be an added advantage to water transportation. It will be beneficial to identify such exporters and importers in the region to market the benefits of using water transportation with the aim of attracting them to use water freight and thus achieve the most basic advantages such as reduction in congestion on the roads and as a result more environmental benefits to society. At present to reach the potential customer segment, a reduction in duty/taxes, subsidies for water transportation, improved road and rail links for final delivery and sincere effort from the side of government officials for the promotion of water freight are essential. Successful stories of water freight from the EU can be used for promotional purpose to develop as well as attracting more potential customers in to water freight.

Do you believe water freight in CAD is facing many issues in its day to day operations due to insufficient infrastructure at the ports and poor hinterland connections? (59.09%)

Most of the ports in CAD were fishing ports and facilities at the ports are suited for that type of industry. These ports depend on small road links to access them and not able to accommodate large modern vehicles. Also, commercial traffic has to compete with leisure traffic during the holiday seasons to reach its final destination. Proper functioning of water freight depends upon the modernisation of ports to raise its efficiency and capacity and well-connected road and rail links to the ports. Specialised port facilities such as appropriate cranes for loading/unloading of freight, warehousing or goods transfer facilities and number of available berth to accommodate big ships requires prime consideration. A comprehensive planning for developing port infrastructure and hinterland connectivity according to the expected rate of freight movements should be carried out before investing at the ports. Research into the possible type of goods that can be transported in and out of them, most appropriate handling equipment to load and unload cargoes, type of vessels needed, best suited hinterland links to fast delivery and collection of cargoes and better strategies to minimise double handling cost will give a clear understanding about how to invest effectively and efficiently at different ports. Some of the ports have enough port infrastructure and sufficient hinterland connectivity to handle current freight movements. At the same time a majority of them are lacking port infrastructure and hinterland connectivity to utilize its available capacity at their maximum. By identifying such ports, as per the above mentioned research results a demand supply analysis can be done to find out necessary improvements needed for that particular port to become a successful partner in conducting water freight in the region. Without having modern infrastructure at the ports, it will be very difficult to convince any potential customers of water freight about the advantages of using water transportation. If some of them are ready to use water freight as matter of social responsibility or with an intention to improve their good will in the industry and society as green

heroes their basic demand for sufficient infrastructure at the ports and fast hinterland connectivity are reasonable to be met which in turn motivate others to use water freight more often.

Do you think logisticians and freight forwarders can provide better knowledge about the potential of water freight in CAD and demonstrate the market more clearly to its stakeholders? (59.09%)

Logistics specialists and freight forwarders have the customer contacts to be able to direct them to water freight, but at present they need better understanding and evidences of successful functioning of water freight to motivate their customers towards greater use of it. As a prerequisite logisticians and freight forwarders need to rethink about all options not just road and rail. They would need to further research it to find out the benefits can be gained through the use of water freight compared to other transport modes. Thus, they could be more informed themselves before they could present the market to stakeholders and help them to select the best available options according to economical and sustainable demands of the customer. Presently professionals in the industry face infrastructure, vessel type and hinterland connectivity problems to encourage water transportation among the potential customers. Their attitude towards water freight is not positive due to these difficulties. Once they felt there is sufficient infrastructure to promote water freight in the region automatically their approach towards water transport will change to accept it as one of the sustainable modes of transport in the industry. The first and foremost solution to gain support from the industry professionals in favour of water transport is the construction of sufficient infrastructure wherever it requires. Otherwise they will be reluctant to present water freight as a right mode of transport in a fast moving industry even though it has many other advantages to be considered. Making of infrastructure is the responsibility both public and private parties. The government could invest in ports or they can attract interested parties to do the investments at the ports. Port authorities can approach regional or local governing bodies to discuss the matter and form different plans to improve their facilities. While considering the

market nature in the region a few more things need special attention for the promotion of water freight among the potential customers. First one is the development of small scale container system. Since the population in CAD is not high as other parts of the UK, demand for goods is also not high. The development of a small scale container system will be used for greater use of the small ports in the region to deliver the required quantity of cargoes. Thus the professionals in the industry can attract more customers by focusing on their low transportation cost by using small containers. To run on short distance multi-port routes, development of a new class of economical, low powered, lightly regulated vessels or tug or barges could be beneficial to the industry. Such resources will give much confidence to logisticians and freight forwarders to promote water freight market to water freight stakeholders.

Do you agree that the government and the Department of Transport have the responsibility to develop innovative ideas and offer more financial support to maximise the use of small and medium sized ports in CAD? (63.64%)

Every port in the region serves its local community in many ways such as providing jobs and economic benefits, connecting nationally and internationally in delivering goods, services and information cost effectively and even people. Ports have strong influences in peoples' life either directly or indirectly. It is unquestionable that any developments in a port will make improvements in peoples' life close to the port. As said before it will give more jobs to people around the port and as a result their financial status will improve, because with goods delivered closer to the final destination, usage of road transport will become minimal and reduced transportation cost will create a competitive price for goods. In this situation the government has the responsibility to develop ports and assist them to serve people better for tomorrow. As a part of the government machinery the department for Transport (DFT) should take initiatives to start making strategies for the improvement of ports by consulting with experts in the freight industry especially from water and maritime. In order to promote water freight, overcoming costs and other barriers can only be achieved at government level.

Being a member of EU, it will be easier to access their advice and support in developing policies for the better usage of ports. The EU has a strategy to help initiate new waterborne services between European countries which could be used in the development of the small and medium ports in CAD. Programmes aiming for the promotion of waterborne, coastal and short sea shipping by the EU give funding for developing water freight. By recognizing the importance of ports and water transportation in society the government and the industry can apply for these funding in their shared responsibility which in turn will provide better chance to achieve positive result to their effort. More than any organisations in the shipping, logistics and supply chain industry, the government is the right authority to speak for water freight and ports. As a supreme authority, only the government can take measures to develop water freight in the country. The well-being of a society is the primary aim of any government. As explained in the beginning of the literature review, water freight offers better environment and livelihood to society. So, it is important to save ports in the region for the coming days by providing necessary help to keep them up-to-date to meet the demand of a modern society. The government can take many actions such as appoint a commission to study the needs of ports, research to identify strengths, weakness, opportunities and threats to water freight and ports, consultation with industry experts, send professionals to learn successful stories of water freight to implement in the country etc. to improve water freight in the region and in the country.

6.4.7 Statements which failed to achieve consensus beyond 50% in the Delphi study

The statements used in the Delphi study were formed to evaluate the significance of the objectives of the research. Each statement developed from a thorough literature review conducted in the beginning of the research. All the statements of the Delphi study framed to prove the importance of water freight in SW UK. A total of 17 statements were used in that a total of eight consensuses were achieved. Each objective was supported with a minimum of three to seven statements. The

expert panel members supported whichever statement is relevant to the topic of the study. The result of the Delphi study indicated that the use of water freight in SW UK is not exactly similar to the other parts of the world. Many factors in the region have influence in the usage of water transportation in the region. The statements failed to achieve consensus will help to understand the limitations, disadvantages and factors need to be considered for the betterment of water freight in SW UK.

This section discusses statements which achieved below 50% agreement among the expert panel. The idea behind such a discussion is, normally an agreement which is made up of consent from more than 50% of the sample size is considered as the majority supports that agreement. Even though a detailed discussion has already been presented on the statements which failed to achieve consensus in the previous sections of the chapter, this segment focuses on the factors which are least important to water freight in CAD. The two statements which could achieve a below 50% agreement among the expert panel members were ‘do you think different levels of regulation (International, EU, National, Regional) and port costs will have a negative impact on the growth of water freight in CAD?’ (36.36%) and ‘do you think that if the ports with sufficient infrastructure and hinterland connections integrate water freight into intermodal transportation this will support just in time and door to door delivery of non-time critical small batches of cargoes?’ (45.45%). Thus, now it is understood that the growth of water freight in CAD will not be affected by present regulations and port costs and it would be difficult to support just in time and door to door delivery of non-time-critical small batches of cargoes by integrating water freight with sufficient infrastructure, into intermodal transportation.

A discussion about the port regulations among the expert panel members helped to identify the pros and cons of current port administrative processes. Port entry requirements had already been made less complex and most of the regulations are safety or environmentally related to run water transportation smoothly. Though regulation is not a significant issue, over-regulation can be a problem to

the industry. Current processes do not seem to hinder the current level of traffic using the ports. Regulations become a complex issue only when it is not explained properly to the concerned officials. Once a company understands the process well it is unlikely to have a big impact on the negative development. Thus, a potential lack of understanding by companies and business who would be interested in water freight rather than the process itself impacts on water transportation negatively. As per the opinions of the expert panel members the existing administrative process and regulation applied to water freight is all pretty straight forward for any competent logisticians or agent. At present the shipping and logistics industry should focus more on the infrastructure issues, marketing the potential of water freight and try to attract new investment to the industry.

Cost is associated with all transportation but in water freight port costs will vary between individual ports. Road transport enjoys much financial freedom compared to water freight. Water transport is liable to pay port costs in each port it enters while a truck can go anywhere in Europe with less cost compared to water transport. In this situation an extra financial burden could create less interest in water transport among the potential users of it. Any effort to minimise or equalise the port cost would encourage an increased usage of water freight in the coming days.

In the modern world of logistics just in time and door to door delivery of goods, services and information are considered as the prime functions of the industry. Consequently, the supply chain will select the most effective and efficient modes of transport to do its function perfectly. An enquiry to find out the suitability of water freight in the intermodal transportation resulted in its inappropriateness due to unreliable weather conditions, tidal constraints, slow nature of water freight and lack of sufficient infrastructure. In order to be competitive in the supply chain, the cost of using water freight must be lower than the road costs and reliability of water freight would be higher. Currently main flows of cargoes in the region are wet and dry bulk. According to the cargoes types, the demand for intermodal transportation is limited in CAD. Success of shipping small batches of cargoes

smaller than a TEU is unpredictable because any applied examples are not available to verify its practicality in a real situation. The spread out nature of settlements in CAD could make door to door delivery of goods more challenging.

At the present, to make water freight more attractive in the intermodal transportation requires major changes to infrastructure. Since the cargoes are non-time-sensitive in nature just in time delivery of goods can be done using ships as stores and can be transported inland when water level is high enough and which would geographically match the area better too. Development of a local container feeder service and a smaller scale unitisation standard which could be handled by mobile plant in the ports could enable local water freight into intermodal freight. An improved road and rail link from the ports and links between the port facilities would provide better opportunities to door to door delivery. A contingency plan to face adverse weather conditions could be useful to handle the situations smoothly. By selecting the right number and locations of ports and conducting some sensitivity tests in the initial stage of the transportation of cargoes we could understand how door to door and just in time delivery of goods can be executed effectively and efficiently and what further improvements could be done to fulfil the purpose of using water freight for door to door and just in time delivery of goods.

Appendix D: Conclusions formed from the three Delphi surveys

Table 6.1 Conclusions formed from Delphi survey 1

The Delphi survey 1			Consensus achieved		Objective	Conclusion
No	**Statements**	**% of Agreed**	**Yes**	**No**		
1	Do you believe the geography of the SW UK is suitable for extensive water freight movements in the region?	58.33		No	To examine the nature of water freight in SW UK, especially in CAD	Many limitations are blocking water freight in CAD. The word 'extensive' used in the given statement to quantify water freight, limited the possibility of achieving consensus in the first round of the Delphi survey.
2	Do you think water freight in the SW UK can support transfer of road freight movements to water?	45.83		No	To examine the nature of water freight in SW UK, especially in CAD	With sufficient infrastructure at the ports and hinterland connections water freight in SW UK can support transfer of road fright movements to water. Now small and medium ports in the region can be used for small quantities of single bulk cargo movements.
3	Do you agree that logistics professionals and freight forwarders are fully aware of the potential of water freight in CAD?	16.67		No	To examine the nature of water freight in SW UK, especially in CAD	Logisticians and freight forwarders need more information about the potential of water freight in CAD. Research on water freight's possibilities and new uses would be helpful to realize the potential of it, in the region.

4	Do you believe by using water freight, the cost of transportation can be reduced significantly compared to road transport?	62.50		No	To evaluate the contributions, that water freight could make to the logistics industry in SW UK	Using water freight, the cost of transportation can be reduced compared to road transport. This depends upon the volume of commodity and the travel distance.
5	Do you believe an increase in water transportation will reduce the negative impacts on the environment and external costs caused by road transportation and increase sustainability?	79.17	Yes		To evaluate the contributions, that water freight could make to the logistics industry in SW UK	Water freight is a more sustainable and environmental friendly mode of transport compared to road haulage.
6	Do you think integrating water freight into intermodal transportation will result in just in time and door to door delivery of goods?	41.67		No	To evaluate the contributions, that water freight could make to the logistics industry in SW UK	Water freight in an intermodal transportation will help just in time and door to door delivery of time not sensitive goods if the overall multimodal cost is lower than road transport and frequency and reliability of water transport are competitive.
7	Do you believe the potential of water freight as a mode of transport is fully utilized in CAD?	8.33		No	To synthesise the challenges blocking potential logistics companies in using water freight as their modes of transportation	The potential of water freight is underutilized in CAD due to lack of public funded marine freight infrastructure and over regulation of marine traffic.

8	Do you think water freight in CAD is facing problems to utilize its full potential?	70.83		No	To synthesise the challenges blocking potential logistics companies in using water freight as their mode of transportation	Lack of investments, original thinking to handle small quantity of cargoes by water, public support, knowledge about water freight and attitude of users of water freight are the major problems affecting the use of water transport in CAD
9	Do you believe complete integration of water freight in the logistics chain is difficult?	79.17	Yes		To synthesise the challenges blocking potential logistics companies in using water freight as their modes of transportation	Lack of infrastructure, expensive multimodal infrastructure, shortage of specialists to assist companies to use water freight, attitude towards water freight and reliability, speed and frequency of water freight services, limit the integration of it in the logistics chain.
10	Do you think water freight in CAD would perform better if it had sufficient trained crew and opportunities for continuous training on technological advancement?	12.50		No	To synthesise the challenges blocking potential logistics companies in using water freight as their modes of transportation	Infrastructure developments and efforts to change attitude towards water freight needs more attention than crew training, for the better performance of water freight in CAD.
11	Do you think there is a lack of sufficient infrastructure and facilities at the ports in CAD to handle more commercial activities?	50.00		No	To synthesise the challenges blocking potential logistics companies in using water freight as their modes of transportation	Ports in CAD need infrastructure upgrade and improvements in hinterland connections to ensure more business activities.

12	Do you think the complex administrative process of water transportation is having a negative effect on the development of water freight in CAD?	37.50		No	To synthesise the challenges blocking potential logistics companies in using water freight as their modes of transportation	Lack of proper understanding of the administrative process by the respective authorities will have an impact on the decision of choosing water transportation for freight movements.
13	Do you believe the growth of water freight in CAD is negatively affected by insufficient government incentives and inadequate promotion by the Department of Transport?	62.50		No	To synthesise the challenges blocking potential logistics companies in using water freight as their modes of transportation	To promote water freight in the region needs subsidy, incentives, tax reduction and more publicity from the government and DFT.
14	Do you think water freight is a sustainable green alternative to road and rail?	87.50	Yes		To assess and compare the socio-economic impact of water freight	Ability to carry more cargoes and fuel efficiency made water freight a sustainable mode of transport compared to road and rail.
15	Do you think firms and society in CAD would benefit more from the usage of water freight in terms of competitive cost, integration across all regions, economic progress, overland congestion, added security, agility in customer delivery,	45.83		No	To assess and compare the socio-economic impact of water freight	The use of water freight can offer competitive cost for longer journeys, and can integrate remote locations in the region. The geography of the region would support water freight for easy customer delivery, which is sustainable and safe.

	compared to road transport?					
16	Do you think water freight is more labour, energy and fuel efficient than road transport?	78.26	Yes		To assess and compare the socio-economic impact of water freight	Water freight needs less energy, fuel and labour to operate compared to road transport. Consequently cost of transportation, external cost and amount of pollution will be reduced.
17	Do you believe water freight is potentially a more important source of revenue and employment which can lead to the economic growth and prosperity of CAD compared to road transport?	39.13		No	To assess and compare the socio-economic impact of water freight	Water freight in CAD can support economic growth in the region, if infrastructure at the ports and hinterland connections are properly developed for better use of it
18	Please give your suggestions for developing water freight as an efficient and sustainable mode of transport in CAD	95.83			To synthesise managerial solutions in developing water freight as an efficient and sustainable mode of transport in SW UK	The expert panel members demanded for government support, better infrastructure, research to analyse the current level of road freight movements and proper marketing of water freight for developing water transport in the region.

Table 6.2 Conclusions formed from Delphi survey 2

The Delphi survey 2			Consensus achieved		Objective	Conclusion
No	Statements	% of Agreed	Yes	No		
1	Do you believe the presence of extensive coastline and accessibility to a number of ports along the length of the SW UK coast is supportive for water freight movements in the region?	78.26	yes		To examine the nature of water freight in the SW UK, especially in CAD	The natural geography of SW UK is an advantage for supporting water freight movements in the region. It will help to save the cost of infrastructure developments at a large scale.
2	Do you think with the help of improved resources; water freight in the SW UK can support transfer of road freight movements to water?	73.91		No	To examine the nature of water freight in SW UK, especially in CAD	Ports in CAD need better infrastructure and hinterland connection to offer reliable and cost-effective service to support transfer of road freight movements to water.
3	Do you agree that logistics professionals and freight forwarders need more information about the potential of water freight in CAD?	73.91		No	To examine the nature of water freight in SW UK, especially in CAD	Logisticians and freight forwarders need more information on the capabilities and possibilities of water freight to create interest among the stakeholders.
4	Do you believe by using water freight, the cost of transportation can be reduced significantly for transporting bulk	82.61	Yes		To evaluate the contributions, that water freight could make to the logistics industry in SW UK	The cost of transportation for moving bulk products using water freight will be cheaper than any other mode of transport. It will also reduce many

	products long distance compared to road transport?					environmental related costs.
5	Do you think integrating water freight into intermodal transportation will help just in time and door to door delivery of time not sensitive goods?	39.13		No	To evaluate the contributions, that water freight could make to the logistics industry in SW UK	Just in time and door to door delivery of time not critical cargoes depends upon the integration of local water freight into intermodal transportation and links between the existing port facilities.
6	Do you believe the potential of water freight as a mode of transport is under-utilized in CAD?	73.91		No	To synthesise the challenges blocking potential logistics companies in using water freight as their modes of transportation	Other than lack of infrastructure, the lack of enough population and lack of sufficient demand for significant volumes of cargo cause under-utilization of water freight in CAD.
7	Do you think water freight in CAD has to overcome many difficulties to operate to its full potential?	69.57		No	To synthesise the challenges blocking potential logistics companies in using water freight as their modes of transportation	To overcome the numerous issues in operating water freight in CAD require integration with other regions, national and European level and a conscious effort to find out practical solutions for each issue.
8	Do you think water freight in CAD would perform better if it has sufficient trained logisticians and freight forwarders in water freight?	34.78		No	To synthesise the challenges blocking potential logistics companies in using water freight as their modes of transportation	To find out solutions for the different issues blocking the development of water freight requires trained personnel.
9	Do you think there is a lack of sufficient facilities	52.17		No	To synthesise the challenges blocking	Due to lack of investment,

	and hinterland connections at the ports in CAD to handle more commercial activities?				potential logistics companies in using water freight as their modes of transportation	ports in CAD do not have sufficient infrastructure and hinterland connectivity to encourage more business in the region.
10	Do you think streamlining and standardising complexity of port entry requirements of water transportation will have a positive effect on the development of water freight in CAD?	52.17		No	To synthesise the challenges blocking potential logistics companies in using water freight as their modes of transportation	Standardisation of port entry requirements will simplify the entire process and would encourage more companies into water freight.
11	Do you believe the growth of water freight in CAD is negatively affected by the limited interest of the government and Department of Transport?	60.87		No	To synthesise the challenges blocking potential logistics companies in using water freight as their modes of transportation	The current situation of water freight in CAD would change only when it gets assistance from the Government and DFT.
12	Do you think the usage of water freight can produce short-term and long-term benefits such as sustainability, reduction in overland congestion, competitive cost, integration across all regions, and economic progress, compared to road transport?	86.96	Yes		To assess and compare the socio-economic impact of water freight	The use of water freight will produce better environment, congestion free roads, less price for goods, easy access to remote locations, and a better economy.

13	Do you believe if water freight is offered as an efficient and well-planned alternative to road and rail transport it can lead to economic growth and prosperity of CAD?	69.57		No	To assess and compare the socio-economic impact of water freight	Water freight can lead to the economic growth and prosperity of a region in conjunction with a coordinated economic policy, and with the support of economic incentives.
14	Do you have any suggestions for developing water freight as an efficient and sustainable mode of transport in CAD	60.86			To synthesise managerial solutions in developing water freight as an efficient and sustainable mode of transport in SW UK	Some important suggestions from the expert panel members were to create a collaborative partnership between all ports, provision for a feeder port, persuade international maritime regulators to instigate a new class of marine vessel regulation for Coastal/inland waters craft and start a conversation about the relative total costs/benefits of water vs road transport.

Table 6.3 Conclusions formed from Delphi survey 3

The Delphi survey 3			Consensus achieved		Objective	Conclusion
No	**Statements**	**% of Agreed**	**Yes**	**No**		
1	Do you believe the potential of water freight as a mode of transport is very under-utilized in CAD?	62.64		No	To synthesise the challenges blocking potential logistics companies in using water freight as their modes of transportation	The region has potential for conducting coastal and short sea shipping, transportation of non-time critical low value high volume freight and small loads to small ports on general or small cargo ships. However infrastructure at ports is not sufficient.
2	Do you think with improved port infrastructure, subsidies and investments for making essential facilities, water freight in the SW UK can support transfer of road freight movements to water?	68.18		No	To examine the nature of water freight in SW UK, especially in CAD	With improved port infrastructure, subsidies and investment for essential facilities and a reduction in duty/taxes water freight in the region can support transfer of road freight movements to water.
3	Do you believe water freight in CAD is facing many issues in its day to day operations due to insufficient infrastructure	59.09		No	To synthesise the challenges blocking potential logistics companies in using water freight as their modes of transportation	Due to lack of sufficient infrastructure and connectivity at the ports and less consideration of

	at the ports and poor hinterland connections?					these issues reflect restricted opportunity for commercial gain.
4	Do you think logisticians, freight forwarders and other officials related to the water freight movements in CAD have to work for the betterment of the water freight industry in the region?	72.73		No	To examine the nature of water freight in SW UK, especially in CAD	A wider strategic approach is needed to educate the professionals about the possibility of water freight because without their support changes in transport modes will not happen.
5	Do you think logisticians and freight forwarders can provide better knowledge about the potential of the water freight in CAD and demonstrate the market more clearly to its stakeholders?	59.09		No	To synthesise the challenges blocking potential logistics companies in using water freight as their mode of transportation	Effective marketing of the concept water freight, and more information from logisticians and professionals would help stakeholders to have firmer views on water freight.
6	Do you think due to lack of investment in port infrastructure, poor road and rail network connections to hinterlands block the development of water freight in CAD?	77.27	Yes		To synthesise the challenges blocking potential logistics companies in using water freight as their modes of transportation	The development of freight in Devon and Cornwall needs investments in port infrastructure, and better road and rail network connections to hinterland.

7	Do you think different levels of regulation (International, EU, National, Regional) and port costs will have a negative impact on the growth of water freight in CAD?	36.36		No	To synthesise the challenges blocking potential logistics companies in using water freight as their modes of transportation	Usually regulation will not be a significant issue. A clear understanding of the legislation and measures will provide better opportunity for commercial gain. A simple regulation will attract more potential business users.
8	Do you agree that the government and the Department of Transport have the responsibility to develop innovative ideas and offer more financial support to maximise the use of small and medium sized ports in CAD?	63.64		No	To synthesise the challenges blocking potential logistics companies in using water freight as their modes of transportation	The government and DFT have shared responsibility to provide substantial support and cooperation to promote and develop water freight in Devon and Cornwall.
9	Do you think if the ports with sufficient infrastructure and hinterland connections, integrating water freight in to intermodal transportation will support just in time and door to door delivery of 'time not crucial small batches of cargoes'?	45.45		No	To evaluate the contributions, that water freight could make to the logistics industry in SW UK	Water freight is best suited to transport non-time critical cargoes. Better hinterland connections, infrastructure and operational systems will improve and make it more reliable to conduct door to door delivery.

10	Do you believe if water freight is offered as an alternative to road transport with sufficient port infrastructure and hinterland connections it will be beneficial to the economy of CAD?	72.73		No	To assess and compare the socio-economic impact of water freight	Improved water freight movements will reduce road congestion, increase port employment, local jobs and local distribution opportunities which could be beneficial to the industry and society.

Appendix E: Delphi Round 1,2,3 questionnaire

DELPHI ROUND 1 QUESTIONNAIRE

1 Your details

Name:

Company:

Current position:

What is your specialist area of expertise:

Country:

2 Do you believe the geography of the SW UK is suitable for extensive water freight movements in the region?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

3 Do you think water freight in the SW UK can support transfer of road freight movements to water?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

4 Do you agree that logistics professionals and freight forwarders are fully aware of the potential of water freight in CAD?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

5 Do you believe by using water freight, the cost of transportation can be reduced significantly compared to road transport?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

6 Do you believe an increase in water transportation will reduce the negative impacts on the environment and external costs caused by road transportation and increase sustainability?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

7 Do you think integrating water freight into intermodal transportation will result in just in time and door to door delivery of goods?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

8 Do you believe the potential of water freight as a mode of transport is fully utilized in CAD?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

9 Do you think water freight in CAD is facing problems to utilize its full potential?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

10 Do you believe complete integration of water freight in the logistics chain is difficult?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

11 Do you think water freight in CAD would perform better if it had sufficient trained crew and opportunities for continuous training on technological advancement?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

12 Do you think there is a lack of sufficient infrastructure and facilities at the ports in CAD to handle more commercial activities?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

13 Do you think the complex administrative process of water transportation is having a negative effect on the development of water freight in CAD?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

14 Do you believe the growth of water freight in CAD is negatively affected by insufficient government incentives and inadequate promotion by the Department of Transport?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

15 Do you think water freight is a sustainable green alternative to road and rail?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

16 Do you think firms and society in CAD would benefit more from the usage of water freight in terms of competitive cost, integration across all regions, economic progress, overland congestion, added security, agility in customer delivery, compared to road transport?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

17 Do you think water freight is more labour, energy and fuel efficient than road transport?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

18 Do you believe water freight is potentially a more important source of revenue and employment which can lead to the economic growth and prosperity of CAD compared to road transport?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

19 Please give your suggestions for developing water freight as an efficient and sustainable mode of transport in CAD

DELPHI ROUND 2 QUESTIONNAIRE

1 Your details

Name:

Company:

2 Do you believe the presence of extensive coastline and accessibility to a number of ports along the length of the SW UK coast are supportive for water freight movements in the region?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

3 Do you think with the help of improved resources; water freight in the SW UK can support transfer of road freight movements to water?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

4 Do you agree that logistics professionals and freight forwarders need more information about the potential of water freight in CAD?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

5 Do you believe by using water freight, the cost of transportation can be reduced significantly for transporting bulk products long distance compared to road transport?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

6 Do you think integrating water freight into intermodal transportation will help, just in time and door to door delivery of time not sensitive goods?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

7 Do you believe the potential of water freight as a mode of transport is under-utilized in CAD?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

8 Do you think water freight in CAD has to overcome many difficulties to operate to its full potential?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

9 Do you think water freight in CAD would perform better if it has sufficient trained logisticians and freight forwarders in water freight?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

10 Do you think there is a lack of sufficient facilities and hinterland connections at the ports in CAD to handle more commercial activities?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

11 Do you think by streamlining and standardising complexity of port entry requirements of water transportation will have a positive effect on the development of water freight in CAD?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

12 Do you believe the growth of water freight in CAD is negatively affected by the limited interest of the government and Department of Transport?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

13 Do you think the usage of water freight can produce short-term and long-term benefits such as sustainability, reduction in overland congestion, competitive cost, integration across all regions, and economic progress, compared to road transport?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

14 Do you believe if water freight is offered as an efficient and well-planned alternative to road and rail transport it can lead to the economic growth and prosperity of CAD?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

15 Do you have any suggestions for developing water freight as an efficient and sustainable mode of transport in CAD

DELPHI ROUND 3 QUESTIONNAIRE

1 Your details

Name:

Company:

Years of experience in the shipping and logistics or related industry; 0-10, 10-20, 20-30, 30+

2 Do you believe the potential of water freight as a mode of transport is very under-utilized in CAD?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

3 Do you think with improved port infrastructure, subsidies and investments for making essential facilities, water freight in the SW UK can support transfer of road freight movements to water?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

4 Do you believe water freight in CAD is facing many issues in its day to day operations due to insufficient infrastructure at the ports and poor hinterland connections?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

5 Do you think logisticians, freight forwarders and other officials related to the water freight movements in CAD have to work for the betterment of the water freight industry in the region?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

6 Do you think logisticians and freight forwarders can provide better knowledge about the potential of the water freight in CAD and demonstrate the market more clearly to its stakeholders?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

7 Do you think due to lack of investments in port infrastructure, poor road and rail network connections to hinterland block the development of water freight in CAD?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

8 Do you think different levels of regulation (International, EU, National, Regional) and port costs will have a negative impact on the growth of water freight in CAD?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

9 Do you agree that the government and the Department of Transport have the responsibility to develop innovative ideas and offer more financial support to maximise the use of small and medium sized ports in CAD?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

10 Do you think if the ports with sufficient infrastructure and hinterland connections, integrating water freight in to intermodal transportation will support just in time and door to door delivery of ‘time not crucial small batches of cargoes’?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

11 Do you believe if water freight is offered as an alternative to road transport with sufficient port infrastructure and hinterland connections it will be beneficial to the economy of CAD?

Answer Options

Agree

Disagree

Unable to comment

Please give an explanation for your answer

Appendix F: Transcription of focus group discussion

Focus group discussion

Chris: I do not think that there is any question that the SW does not lend itself to. There are one or two limiting factors more or less we have lots of small ports which have in tight relatively limited depths of water for ships. If you go on north side into North Devon for example you also have limitations in terms of tidal access, because you got a very high rise and fall of tide that is not necessarily a limiting factor and we know that if you look at south wale ports for example. But you do have to accommodate the rise and fall of tides, so yes, I mean no question we have an extensive coast line and very little to disagree with that point, I am actually surprised that it is only 78%.

Ian: I think you are right Chris, you know that as you say there are limiting factors with specific ports, you know, I am also throwing their ability to handle large freight at all. We discuss this before, in a way like so we think we need to identify the port which can be invested in deepening and expanding berths, cranes and all that kind of things. If we have such things, then we could have something to sell and we got to identify that we had an aged maritime something in Torquay that will be absolutely fine.

Chris: We do have a Brixham, of-course we got Plymouth, but Plymouth is limited by naval operations.

Paul: I agree I mean historically ok, the transport in s w was vary in maritime so it is one of the input of the road systems, which in fact we lost the railway systems in many ports, there are limitations what I say in many ports but there is I think opportunity in the large ports still. We are not making use best of that and I would stick and answer to the question is yes ok. With limitations I agree there are opportunities.

Peter: For me as far as overlooking the history. In history we can see there is a major maritime activity there, complicate the way for centuries and then we find the costs, the costs of using maritime and other forms of transport gradually change railways came, they were to a large extend took over because they were cheap, they got paced out because of the cost of road ways at that stage was very cheap, that was the reason why we have such a large induction of rail, so if we are going to have a viable means on marine side it got to compete in cost terms and I believe therefore the issue, you are quite right I mean one of the big advantage is we have coastal operation.

It has its limitations and we look at all those, but we got to find I thing in these days other ways of handling cargoes, and particularly on interchange we are bringing to the end customer on the land.

Chris: I know we got quite few points on there. We got number of points on the agenda since we have limited time so think that covers everything, pretty much covered most of it

I think item 2 the sustainable green alternative is slightly a different issue but certainly once again I am actually I am pretty surprised that people can disagree with that, it can be it should be a sustainable green alternative so having said that once again you got to qualify that slightly we have destroyed our marine environment is only a green alternative if we carry out sustainable environmentally friendly shipping operations, but I think that is in heaven,

Paul: But having said that the shipping industry is aware that the way that is taking activities in fact make sure that there are more sustainable opportunities.

Chris: Exactly.

Peter: One of the things, I was not clear about, you talk about some of these Delphi statements about SW UK (here after SW UK) and you specifically mentioned we are just talking about CAD the SW UK is different to CAD (here after D and C).

Sapna: not really

Peter: it is. Sorry as a region SW covers a bigger area than D and C

Sapna: that is true.

Peter: We take into account only goes up if we designate SW UK it will be anything from Gloucester all the way down and It covers Portland and Dorset as well. So, we know we got to clear on what we are talking about, that is my first point. My second point if we are talking about freight we have to think about where it is destined is go to. Once it is come to the port. Is it freight for the D&C or is it freight for the SW, is it freight for the rest of the country, those are the things I need to think about when looking at it.

Sapna: First we specifically look into D and C because as I mentioned before it is very difficult for me to reach all the ports in SW UK, so I restricted my area of study to two counties D and C and next is the freight. This research particularly aims to consider environmental concerns, because when using water freight, we have sustainability, lot of advantages. So wherever possible we will try and transfer/ transport from CAD to the other parts of the country, other parts of the world or regionally, it covers everything. So, it is not limited to D and C.

Peter: So, it is freight comes in via water and goes anywhere else in the UK

Sapna: It covers inland shipping, coastal shipping and short sea shipping so it is international.

Peter: Just like to expand a little point here you know in Liverpool they are building a big new container berth on the river, it would take the biggest container ships around; it is being built by Peel ports. It is costing 100 million pounds at least and It is back of the study, which they have done, which owed that 60% of all containers entering the UK can be distributed cheaper from Liverpool, well we know that in a way, because the Liverpool is near the industrial heart than of England, so containers where they are coming in through Felixstowe,

Southampton, wherever they are all destine up there, so what combination of cost, we got inland costs, we got sea freight cost, if they have taken a view they can attract big ships now, with sufficient capacity to green at least the share of 60% of the freight to Liverpool.

Now in a sense actually we got to do here is we got to find out what percentage of freight comes to the broadly speaking SW UK, that is Cornwall, Somerset, because there are two kinds of freight, liner freight and spot freight, things like shipments of fertilisers, timbers, coal all these kinds of coastal traffic in bulk and then the container traffic and the two are rather different because containers are consigned from a consignee to a recipient and it has goes from there to door to door like if you want to move from your house in Australia to your new house in Exeter you book your container and you pay 3000 dollars, it will take it right your destination. This information can only be obtained through customs record as far as I know, because we can ask freight forwards for example that what you think about it, because they do not have the whole picture, they have the picture of their own customers, so to get the whole picture we have to find out from some central person where it is, so what obviously Liverpool did is sat down with every single container entering UK and they looked about where they are going like where it is final destination was, they worked out a cost in Liverpool, they compared the costs of Felixstowe and they made a decision to build this new berth in this river on the Mersey, because as all so anyway. Also, in addition to that there are lot of containers to discharge on the continent we do not know how many is that. What we do now is lots of containers go to Ireland, and on the way to Ireland containers can stop at Falmouth or Plymouth, or wherever you like and drop containers off and on their way back pick containers. We have a good opportunity to focus on this sort of feeder service between Amsterdam, Rotterdam and within gulf coast.

David: I was not concerned about that when we were building Devon's Ports we realize the main highway for the main container Ships coming in to Europe which going to go through the English Channel rather than round I think. So one of the reason for building Devon's port is now has been replaced by the London one

because they come now, if you look at the size of the new container ships quite clearly they will probably have a capacity where they want to go into two or three European ports and they were only be able to go in to a few, so either here what I should say I think we ought to be aware there is a counter side because the east through the English channel has attraction because it lands into the ports serving the right options.

Chris: I mean ship owners hate going to Liverpool hate going to Bristol in these kinds of things absolutely loads of it because any deviation from directions from Rotterdam wherever is actually hateful to that, but what people got to do is to look at the sea freight, look at in and distribution as well. But especially as container ships getting bigger and bigger, and bigger, there will be more and more demand for feeder services.

Peter: I think you are right looking at awful destination as well.

Ian: It is very difficult to do believe me or not, but it is. I was just thinking about of an example where talking about Liverpool, I think it is important for the south west. Liverpool the new port now, they are bringing in biomass for the Drax power station and that has been put on to rail to go directly to the address

Chris:(It is indeed)

So, you got to look at that infrastructure that is available within the SW as well as David said you know along the railway system in the SW is disappeared.

Chris: I think there is a further complicating factor actually as far as SW is concerned. The prime driving source to our SW economy is micro business, and by their nature micro businesses do not control shipping movements. They don't have their expertise or the size of organizations to have their own shipping managers. So, if they are exporting they will almost all ways export on an ex-works or FOB basis, if they are importing they will almost always import on a CIF domicile basis, which means to say that in the SW UK very few are the people who are exporting or importing are actually controlling the movements of those

boats. So, if we got twenty people who are shipping from the SW UK to the North America the control of virtually all of those consignments certainly nineteen out of twenty will be docked all over North America and it will not rest here in the sw.

Peter: No it is quite a big job to decide people to understand is I mean I used to do this wood coal, I used to bring in shipments, they are only be half a dozen receivers. We got to look at the costs from you know thousand tonnes from Bristol to Derbyshire and Bristol to wherever then put this in to a kind of port to get a result out of it giving by better grasp looking all the costs for take them to Southampton or to Liverpool or somewhere else.

Then to do with millions of containers it is actually a big- big job, that's what computer for us. Is not it. I am not saying it is impossible, but it is a very big job. If you can identify I mean after all if the s w was not an island in Atlantic it would be big enough to have a little economy to have a port, have a ship calling, coming and going this that and other thing.

So, we need to look at it in a way that is because it is quite a few indeed in D and C.

Paul: It is relatively a small population compared to the country as a whole. And it is quite a spot population. So, we do have these problems,

Peter: It is bigger than Northern Ireland (yaa) Northern Ireland has a port where they have container services and they have bulk services, they have coal, cement, timber and all sort of stuff going in there and they are reasonably busy port. And they have their own hinterland and they some hinterland in southern Ireland. But they cannot have more than two million people, so theoretically we should be able to support a port something like that scale, but I do not think we can support lots of little ports because simply it cannot gear up to the number of standard carriers, cranes, berths and turret.

Paul: It has got the fact that there are no substantial ports between lands' End and Southampton

Peter: No that is the problem; see Torquay is actually quite ideal

Chris: Brixham may be

Peter: Well someway Torbay, Brixham, it would be sort of viable theoretically viable

Sapna: Can we move to the next point, options for feeder traffic

Paul: I think the option for a feeder traffic for a feeder based ports within the s w that can make use of in fact truck traders which are in fact all-ready in place constant and Ireland in fact generating from new traffic from feeder ships which off course is a part of the results of the massive growth of ship size

Sapna: Water freight uses less energy

I think answer is that certainly in that case when you can drive a container from far east UK today 500 dollars a box actually cost you that. In fact, Bristol to Felixstowe though actually some idea though efficiency per mil cost (that is right) cost per mile it is really negligible

And one of the thing I found out fascinating is once upon a time we used to talk about the sorts of barriers to trade was transport cost, we do not talk about that any more. Because the cost has come down to such a level in fact it has no value.

It is in mini school. For example, 14 pairs of shoes from India is about a penny because the costs are in the transport side. thousands of pairs of shoes comes in containers even motorbikes but actually new skill but if you are not containerised if you messing around then actually if you are sorting stuff handling it by hand or by forklift, or by crane then off course cost will go down straight away.

Ian: My interest is to produce innovative new equipment's far cheaper like gantry for handling I think that is the necessity in the future rather than trying in bringing big cargoes, we have not got convenience. What we got to do is to have much more official way of distribution of cargoes.

Chris: Can I actually bring out a little bit of case in port which I looked at a Europe level. You mentioned Drax. We also got other sorts of power stations obliged to, I do not the current percentage is probably 10% of biomass. Biomass can be all sorts of things. Somerset produces mis cancers which is bio mass. We grow bio mass in Somerset. Other sort of power station we can touch it in low tide almost across the Bristol Channel. The only way of getting freight across that short stretch of water is to drive all the way around, which defeats the objective of burning bio mass to cut down on carbon emissions. We have no simple handling shipping structures which will enable us just to run a cheap operation across that very short stretch of water.

David: That is a one-off situation and that is a spot cargo where you use a captive ship (that is right) which runs back and forth. I mean it is all a matter of innovation to do it, isn't it?

Chris: I think that is the point David is making. We presumed to have lost an opportunity in a way when those opportunities materialise, because at that time I was trying to sort of develop that idea. In the end the people who were selling them as cargoes as agents went out of the business. Perhaps if we had been able to send barges across the EU they would not have gone out of business and it is quite noticeable that the sale of missed cargoes in SW reduced considerably, because they have not been able to find the right market for it even though it is right there if only they could reach it. So, I would like to also think it is very valuable we are looking at in terms of feeder services. I think we also have to sometimes go back in stages and think small again, as in terms of small port that is where you can think small when those opportunities arrive.

Now I give you another example actually the numbers of road tankers which go every year from I believe it from Plymouth to sustain the fuel on the fishing boats in Brixham is very considerable and environmentally damageable, one coastal tanker going in periodically and putting in small coastal tanker periodically and putting into a tank which will then supply to the fishing vessels will cut off all of

those road movements. So, we are not thinking small, we are not thinking big, as for as reasons which we have discussed and we are not thinking small either.

Can I suggest if we go through all of these point by point we are going to take quite a long time.

I would say because I don't think am I right to say none of us disagree in any of those general conclusions we agree with all of those conclusions

Basically, we agree with all those points

Peter: I saw a small you tube video from Holland a smaller ship launch, it was quite a nice gas fuelled, cement carrier smallish probably around ten thousand tonnes it built just along-side the canal launched it sideways, splash into the water, bang… job done (that is the way how we used to launch years ago) if they can do it why cannot we. We are always mourning about ship building. Why we cannot do it, we always mourn about no money. They are building little ships all around the place. And it is same thing is applied to these kinds of businesses as well ports and harbours and forwarding we don't seems to be innovative do we.

Chris: My theory is when I was running ferries in Shetland I found very rapidly Orcadians and Shetlanders all think because they live on the islands they are experts in ships, some of them are, percentagewise, more than in most places because they are Islanders but a lot of people who could not tell about from astern also think they are experts in ships because they live on Islands. And we in the UK I think also fall into that fact we think we are a maritime nation therefore we know about ships therefore we are a maritime nation and we don't have to prove it in any way (We don't have ships) yes, we don't have ships. And I think one of the problems is we are resting on past glory. Without realising we have done nothing to justify any longer this idea that we are a genuine maritime nation.

Paul: Going back I think there are sorts of innovations taking place, I think in Plymouth for example there are some new developments in terms of cement storage on the power station works. That is going to generate shipping

movements, it won't be that many nevertheless we should say that is actually supplementing a cement storage facility on the other side. So, where there is use, there is demand in sufficient size. In-fact opportunities are there, and I think that is the key to it. What is the demand I mean demand positioning within D and C? The whole thing is commercialized, isn't it? Yes, it is where there is an end customer.

David: The other thing which factor is actually the rubbish collection

Ian: More containers are coming up in SW not rubbish but recycling

David: Recycling is also domestic rubbish in fuel stations for example waste to energy of course there is a big fuel station against domestic refuse.

Paul: Same with Plymouth, when you use incinerator which is essentially got to be water front sited it just has to be not only for Naval Base but being an opportunity to collect rubbish from farmers from Torbay and Torquey and taking to the incinerators.

Chris: There is an INTER_REG programme on at the moment, which is a circular power production cycle within ports and but so far, I haven't find anybody is interested in taking it up. There is actually an energy programme which I am involved for Torbay at the moment I think I agree with you the transfer of transport of waste for waste to energy product is definitely an area and is an important one.

Ian: If you looked at the way the railways replaced Canals they were owed to work out some financial benefits to put a railway as close to our canals and actually today the roads are very difficult for our government to pay for, but they are paying for that. So the advantage is if we aware of the roads were by putting on the heavy cargoes and there is an exponential reason that the more heavy stuff to put on road is quicker In theory, if you do that the only people that can pay for it is the government because they are the one who is paying for the bill for the existing infrastructure, therefore is a private enterprise to come in and start doing things,

there are people, and people are looking at the rest of all, but the cheap cost of road because the government pay for them starts the economic hierarchy.

Chris: It is not a level plane

Ian: It is not

Chris: And the other issue of course which is associated with that is the SW port by enlarge suffer from access port land (yes)

Ian: yes, you got to do something about it unless it got to be earning enough money big in-order to afford the deepening of it etc. so this is a sort of chicken and eggs thing

Paul: Times say that we know that there again in Plymouth the infrastructure in Cattewater area was in-fact developed for undertaking of taking vehicles on directing to the A38 and it is a very short distance no way they got to go through city nevertheless in all the planning structures of Plymouth they do consider the usage of port usage, I mean it has to be moderated I mean of course obviously the peak demand of the traffic but nevertheless on the east side it is a very straight forward link road to A38 because of course not part of the UK strategic road network which we don't reach that until we to get Exeter which is part of an interesting feature. We are penalised because we cannot in-fact have motorway traffic until Plymouth. We are only a two lane sort of structure and if we had any growth that actually cause difficulties that do now one major breakdown I mean the other day the cars piled up that way we have got problems.

Ian: I think there is a breakthrough possibly here on the first of April we get the new organisation for the highways for the first time to teach us the strategic plan for the whole country and that is not limited to the what they call the main strategic runs and it is very important for the problems beyond the major network are in-fact dotted by that organisation.

Peter: At the moment it works, bit like the environmental agency we got major routes which are run by the high ways of England and we got the local authority ones which are all the other roads

Ian: I am starting from the F S B (Federation of Small Business) point of view as aware we are very much aware of that how important that is going to be we have our rural committees as well as people talking about the rural problems. So, it is going to be important whatever we do it in this area that is going to interact with the organisation.

Chris: And indeed, actually I think your problem finds very good chance that will be on the agenda this afternoon we are going to discuss.

Peter: So, we do have one port in the SW the Bristol which is reasonably sensible, but ship owners has low, I mean to go around Bristol, they got to go up the Bristol channel and come back again and as whole day on the voyage

High tide, to make you up calculation and next day on every trip so people constantly calculate ship owners how much it costs to go there how much they save if they don't go there. So, Bristol in a way has the same problem as what we are discussing here how can they improve their business.

David: What they want to do is they want to build the part of the harbour out in to the estuary, so they have the all tide access ports; the politics stop that happening because of the barge etc.

Paul: The economics about I think really

David: I am hoping to be part of the development of that estuary.

Peter: They have found information for this that they not gone ahead with it because they need to have a kind of major carrier somebody like Maersk, to act as a kind of.

Ian: They have that

Chris: Do they

Ian: The government stopped it, because they are not giving the planning permission to do it, and the plans were there, and the carriers were ready.

Paul: I think the Bristol is half way to London. I think we have got the opportunities for the West

David: I am not using Bristol as an instead-rise but it is an example of how port works I know the people they work very hard, attract the business within the people, train people always trying things to get them in there. But it is quite a battle to get customers in there.

Chris: They got big facility for cars

David: We got good facilities, plenty of space, of-course they have not got invader kind of thing of it. They do well on cars, may be well on grains as well, animal food and these kinds of things, goods shed there, and they lost the coal because of fire stations.

Chris: They are also competing with south wales

David: I think South Wales more competing with

Chris: I would agree with that. Sapna once again I am conscious about the time limitations again and I think we need to concentrate very much on what you need to get out of this, because to be very honest these are issues which have some complexity, we are all quite motivated of it.

Sapna: Definitely you agreed with the results of the Delphi study (absolutely) next is the suggestion for the development of water freight movement in the S W UK

Chris: we talked about that

Sapna: The suggestion for the policy formulation for the development of water freight like government have to produce some kind of policy for promoting water

freight, marketing the benefits for attracting investments in development of ports and infrastructure like hinder-land connectivity and importance of that kind of policies in promoting water freight would like to know the opinion on that please.

Paul: There have been policies. Which water freight I think was actually name of one of the policy organisation of the government try and promote short sea shipping and river shipping, that it is not been taken up very much, despite some of the interesting innovations like barging Congo sit down on the rivers.

Chris: One thing which we have not talked about in fact in that water ways Tim Jones is Chairman of Devon & Cornwall Business Counties and a board member of the Heart of the South West Local Enterprise Partnership (having served as Chairman from its inception). He is also involved in a number of other organisations including independent Vice Chairman Water Futures Panel, Board Member of Plymouth Chamber, Vice Chairman of Plymouth Area Business Council and Board Member of North Devon. Back in the 19th century there were consistently efforts and indeed acts of parliament created for a canal link across the south West and they did actually complete that just about by using the Bridge Water to Taunton canal and then the Grand Western canal which goes from through Wellington and joins up in Tiverton and they are actually relatively small and on to the river edge now Tim agrees one that thing which gets government ministers exciting is big ideas, and he said what could we do for inland water ways, well actually really the only thing what we can look at it in South west would actually be because it is an interesting thought what would we do if we really did have a good access, I mean leisure boating, it will be quite important and no question about that could that be used that we know it is little bit of an outboard one but don't totally ignore it. I mean the cost will be considerable. should be the complications of the concerns of land ownership all sorts of things, roads and what have you, but the big gestures sometimes is what get politicians excited, so I just throw that in bit of an intention

Paul: Having said that of course we do have the River Tamar for example and that work goes places like Calstock. I mean there were days when these were ports of significance....

Chris: There were indeed

David: And using it we get you up to the main roads as well in the centre of the day, but the amount of traffic is a problem, start well with the size of the economy, we may study it, we don't know.

Paul: Precise to be just need to talk about port like Plymouth then that is what used to take all the minerals down to Plymouth. At one stage the figure is that Plymouth was actually a larger port commercially than Liverpool in late 19th century.

Chris: Morwellham Quay the tonnage wise was one of the largest in the country

Paul: Was massive.

Chris: This is I think where I know David thought on and indeed mine as well re-evaluation of small into simple that can be put back into transport that we don't have

Paul: Can we go back to your point about Bristol port: they did a lot of work didn't they? I wonder if some of the work they did was actually about carbon out of strong vehicles and they made lots of that on their modelling of the advantages of carbon facts about Bristol as a location and we seems to forget that.

Peter: They did a study, I am sure they did

Paul: because it is part of their argument for the development and which went to help to get it through the planning processes.

David: They got whole department of people who can sit there and dig in to these kinds of statistics. The thing about the canals is probably very heavy but interesting way to invent those regions. I think there should be a campaign to join

the wash to the Severn and it is only 38 kilometres of either this use or un-usable canal and then if they can do that, they can sail all the way through from Norway Canal to Bristol Channel. You can do it now, but it is the huge deviation around, it takes a week or something to go around, so it is sort of time pressurize. But it is only varying for leisure but

Ian: It really matters about the cost, I think it is major.

David: I mean that is the other thing about it. We are talking about SW of course, no point is that the SW is big in leisure there is also in cruising is not a big way but it has cruise vessels relatively and there is scope for more cruise vessels in it, they can do all sorts of places and they can go anywhere around outside so that it is an area of possible improvement.

Paul: Going back to the policy formulation. I mean policy formulation for the development of water freight, there is quite a lot of work done there, so does it need to sort of re-integrate or does it need to be reconsidering.

Chris: We detected there is a little bit more than an open attitude towards that these days and there has been for some while I don't know that would be my impression that there is from the government.

Paul: Well, I think most certainly the government is listening necessarily to anything to do with maritime activities.

Chris: For first time really pretty much in the generation

Ian: I think in roadways and canals UK waterways canals because canals may be quite eager for more freight rather than

Paul: I think one of the issues they must be thinking of, is to be aware of some sort of the vehicles, problems, and traffic jams as such in the London area and if you think what they are doing for example getting rid of the waste material from that new rail system they are building. The new sewage system; waste is all taken down the Thames and they are negating in fact the road traffic transport

movements and the chap called Clive Kessel is been involved and he is a Cornish man and he is a sort of involved with the development of the system (Peter: Which I work) and so the businesses using the sea and using the rivers is something which is sort of the developed tends not to be seen. But there is no one.

Chris: but more so than I than my experience for the last generation

Paul: I think there is a congestion cost this is what is doing it and if you can reduce that congestion cost I mean that we are talking about that waste material I mean we got the quarry waste sort of disclose the situation again other channels using water system right from city centre is really cost, the sort of things we do so I think there is and are opportunities which is yet to be discovered.

Chris: I think policy formulation in answer to your question seems to be that we think that actually various progress we made in this and the opportunities are better now which have been for a long time and people are listening that does not mean the battle is won. And certainly I think if you deal with local authorities for example I suppose to perhaps centralised government I mean I suspect the performance in this respect of the local authority will be enormously patchy (Ian: As it is with the left as well) yes (Ian: not on toes) no no you get no arguments from me no definitely and their understanding of maritime issues is patchy as well

Paul: What you are saying really is too grant sort of schemes from the central government. It is actually put out to the local authorities and LEPs to devise that system within their own remit to make more efficient than their system.

Ian: We have not got people within those authorities in local agencies but actually have an understanding of maritime (Chris: and you are not going to get anywhere) you are not going to get anywhere, because they cannot formulate the policies as they are not aware of it.

Chris: David is going to say about that, I am going to go because I got another meeting about transport in Exeter this afternoon which is chaired by Ian Harrison who is the transport planning officer for Devon for many years, high respected by

his own admission knows nothing about maritime, but he is a good chap and he is prepared to listen, so I think where we got good people who are prepared to listen that is already an advantage and I think to some extend we also got, we also suffer from local authority inertia as well.

Peter: Good, given the state of funding so on through local authorities if it is not a priority now it is not going to be.

David: What could do having got all that I want to hear what your study gave up

Sapna: Regarding suggestions for that… policy formulation

David: You said that it is good idea using maritime (yes) did you look that how take that idea forward. You pointed out that maritime has considerable advantages, but how can we take that forward looking at all the disadvantages, have you looked about it did you have more information about it

Sapna : I got some disadvantages from the expert panel those who participated in the Delphi study and they have told me like because of the poor hinterland connectivity and infrastructure at the ports is quite difficult to integrate water freight into the logistics chain so the first thing the main disadvantage of water freight in CAD is lack of sufficient port infrastructure hinterland connectivity. So that is why I formed a group to discuss these kind of disadvantages and advantages of water freight. Here we are discussing about the suggestions for that. could you please talk further about the barriers to policy formulation?

David: I mean your problem is simply translate this very good study into some kind of reality that is the difficulty is moving from the academic to the real world and I mean so in simple terms as there are four elements, one is passenger two is liner three is bulk four is inland water. They are quite commercially they are totally different.

Paul: I was thinking another port in our area that is Teignmouth port they are making investments in further warehousing on the front. I do not know how many

hundreds or thousands, but it is certainly an extension on the warehousing sort of thing.

Chris: In a couple of weeks' time I will be making a presentation on harbour board in Teignmouth really on what we are talking about today actually, and Teignmouth was very well spotted.

Peter: I think that hits the nail on the spot. Local ports, sort of trying to develop their own things, hell lot of energy and possibly money is going into but it all at the local level

Paul: But they do coordinate there is a SW port group produced a new brochure have not they upon the need for the SW ports and couple of them with me. So, they are aware of what is going on, they compete with each other (Peter: yes absolutely) but of course Teignmouth is a part of ABP group, ABP of course got Plymouth sort of mill bay and of course they are actually also run from Southampton.

Chris: And also of course they have South Wales as well

Paul: The ABP group is quite a significant group. I am sure they are all looking for opportunities and they only act when in fact an opportunity actually will see a positive return on the bottom line (Ian: absolutely) only hesitation is cruise shipping.

David: Obvious choice partner are not they, they try and talk to in depth about this study and how to proceed and so on. I mean they are multi billion pound company now they got 23 ports, you are right I mean in Teignmouth they do lot of timber and other products.

Paul: This is the evidence I see regeneration and rebuilding and of course they mean they do in Teignmouth that is the only reason why the substantial sum offer to them was. They obviously put money there where there is return for it.

Chris: Do you feel, I mean I have had deals with ABP in South Wales and some good people I suspect that large organizations and ABP is a large organization tend to suffer a little bit from same sort of inertia at times and stereo type thinking that local authorities incline to it, so something which affecting big organizations where the most dangerous things you can do in the courier path is to make a decision.

Paul: It is interesting when we compare Bristol, Bristol is an entrepreneurial port which is in fact lean and thin, and is able to be flexible in out moors with in fact organization like ABP which is large extensive but ok you sometimes get a feeling absolutely right and say that it lacks that sort of lenient and that ability to take advantage of opportunities unless they go right to the top and come back again.

Chris: And indeed thinking out of the box

Ian: And they are going to concentrate I think that is a part of it all the major port they own, rather than developing for small benefits we don't invest in it. Rather they put in to the major ports for bigger returns.

David: If you had a bright idea we could go to ABP. You say "I got this bright idea to make some kind of partnership expanding these sort of small container feeder ports" or something like that because if we think Teignmouth to kick off, then you play a sort of centre of gravity. It would develop Teignmouth. It is not bad, just off the motorway; it is not far from anywhere.

Chris: Yelland actually extending started taking to the Taw and Torridge started taking cargoes again really first time in the number of years the Taw and Torridge is getting cargo ships and bit of a die ride away for many years (Ian: Used to be a local port) yes sure. I pretty much SW has on the issue which we have to tackle in the SW is that our companies are very small and as a result a competitive disadvantage because of our combination of size and location we can only export through grouping services because most of these small companies cannot fill 20foot containers. Grouping services are almost universally based at bases like

Barking, NEC in Birmingham, Liverpool, Felix taw and what have you. If You got to stand on our motorways you don't see that many 20 foot or 40 foot containers going past which is sound by you see very much far fewer than you would on M6 far few. So, what can be done for regions of relatively low industrial indulge to enable them to compete?

Peter: You could start an ICD which is Inland Container Depot at somewhere like Teignmouth area, Exeter or wherever and not rely to start with on ships again your container gets exactly running (Chris: Or combination of course of bringing feeder ships if you got enough otherwise stick it on road) as soon as you got enough and you got access to empty containers, small containers, need to ship to Australia Rotterdam or US bringing back empty containers price of kind of changing gravity somewhere down here in the Exeter area an ICD would probably be viable and possibly if it became big enough you can speak to ABP about expanding Teignmouth I mean afterwards we are over there, commercial proposal, they will back it up, builds new berth quicker than Ireland.

Chris: I do see the Irish is been quite good island Just because we quite rightly said you know the feeder traffic coming from the republic of Ireland and going right off our coasts and unlike either coasts relatively easy for them not to call in. So I see the Irish is been quite a key to parts, and indeed has it happen, I don't know I have Irish shipping agents that I work very closely with that so happen. So, I spoke to him about it.

Peter: All the Irish containers coming into the continent are all designated to these islands, so somebody is confused they are trying to go to Ireland, so they go to Ireland. We need a similar thing where all containers destined to CAD are identifiable and they can be put aside to be feedered because otherwise it has to feed through Southampton or Felixstowe or wherever and we may miss out on them. We don't need many, we have to get 50 a week or something like that and that will be a good start.

Paul: The downside is that you are going to have to have a system for the discharge that will be expensive involving infrastructure and a project for the containers. For that the region will need to have small ships with on-board gear, for containers, designed very recently. I tried to review it and I gave it up later. Which was looking at containers ships of berth wise small sizes with on-board gears for discharge for that was probably the first stage and is going to be regular.

Chris: That is very interesting because David and I had been talking about, because I mean look I sort come from a slightly different shipping background, so far you know I have been running small vessels in extremely remote places where the idea there being a container terminal is laughable really, find the idea being anything there would be laughable, and we handle a lot of operations using landing crafts which are undervalued in Europe I don't know why we don't use them anymore they are immensely flexible by source. I think they got a bad name after the war it may, well you know I mean I used to have more success in extremely remote places all you need is really a beach and a few strong roads to carry some sacks on it. But use of those types I think we have for example we have McAdam service which operated for a while across the North Sea. I don't know if any one got any experience of that. You know bargable caravan, which was a small sort of like a mini version of LASH which enable you to sort of discharge a barge and sort of sent it off to different directions you know. I am not saying the solutions here but I don't think we are visiting these ideas and not that is true. we got a little bit stereo type because international firms built around larger and larger movements and I am trying to sort of get people think smaller again as well to go back to way but not to go back used to be, but look at how you can handle very small vessels.

David: That is what the feeder vessels, power sort you can get containers from mobile points anywhere.

Chris: Implementation, just to say about the barriers on policies I think one of the big barrier is being, concentrate on barriers to implementation I

think we detect the barriers have been lifted recently, there are fewer barriers now there is a willingness to consider (David: wale is being lifted) I think that probably right.

Paul: I used to be with Plymouth university, I have been retired, and I was lecturing in navigation and then I went to maritime business and for the last fifteen months I have been teaching navigation again at the western maritime training Ltd Crownhill.

David: I think in Bristol at the top level I really couple of studies done on navigation and I will be very interested to go on those because I don't think the rules are relevant at that and how we would actually upgrade very much involved with the company which my son is a part of and is the only company in the country, licence to put alternate vehicle on the road, but I now want to transfer that, try and understand the long term future may be even get some research about what we are having going to deal to drive the vessels

Paul: There was a conference held by Nautical institute in Bristol on autonomous ships, Plymouth university is actually devising an autonomous ship for the celebration of the Mayflower sailing is called the MARS project Mayflower Autonomous Research Ship. Professor Kevin Jones, Executive Dean of the Faculty of Science and Engineering at the University is leading the project. They are looking for partnerships now.

Chris: I think if you can focus on sort of giving you the answer for the barriers of policy formation and barrier for policy implementation I think what we identified is barrier to policy implementation we think barrier to the policy formulation at central government level is probably been resolved to quite a large extend that has been lifted. But the barrier to policy implementation comes from lack of understanding of the sector I suspect at regional level (Peter: Lack of entrepreneur as well) indeed ya in the centre, perhaps because once again the sector is been is largely controlled by the best of reasons by the bigger bodies like talking about ABP and

part of these organizations so often and also because we are getting bigger and bigger

May necessarily do things in order to get control where which can be controlled and reach somewhere in really

Chris: So, I think I mean any other barriers to policy implementation policy formulation. So, we have identified lack of entrepreneurial activity within the sector, lack of understanding of the sector, anything else?

Peter: There is a question about commercial knowledge, about exactly how much money income the freight could generate, that is the difficult thing to get at.

David: That is true and essential if you going to work out where it is worth investing in those projects.

Peter: This is why we need a big number

Ian : There was one study I got, the problem is it doesn't really give like to end to end and lot of other stuffs go in the container and of course (ya ya absolutely)

Mountain of information bulk containers from Australia which is the whole cost

Chris: So, the gathering of regional data is a key issue and the lack of these availability. The trouble is in when you start to think that discourages the entrepreneurs because the entrepreneur all want to make a business case has have to access data which is just not available.

Paul: I mean having said all these there are so many things in the bulk area, thinking of the actual stone for Lagoons on the Bristol Channel, the planning issues could be in fact a barrier to policy implementation because that is been post by the Cornish (Chris: By the five people not the Cornish we don't live in Cornwall any more) ok right the idea is ok in-fact the reduction of the slag tips

right in Cornwall because the material there is of high yield understand Singapore for example was running out of sand they need desperately and they have talks about using the slag tips at Cornwall but you have to in-fact invest in terms of infrastructure to get that out. So, there are sort of pockets of things but the basic implementation is actually the business of the environmental issues both those. One is already we know is cost and other is difficult to get through.

Chris: The trouble is when we come on to environmental issues very often environmental issues get determined by the three people down the road and nobody looks at the global implementation. GIobal implementation for example are not activating the quarries in Cornwall to provide the material flow Swansea bay tidal Lagoon is the back stock is come from far further fields of greater coast and overall implementation will be if you cannot do that anywhere then you don't have the tidal lagoons, so you don't produce the tidal energy which consequently has the effect that we got less environmental friendly. So really environmental audit is very often overall is not well done based on local prejudices rather than on a global view.

Paul: I think that is what the difference what we have sort of ourselves and China. China will drive through whatever happens they have a plan whereas we have a plan and then distracted years and years by environmental lobbies which in-fact reduces that opportunity and that quick action sometimes is necessary to get yourself to the market place I will say that is a barrier to the policy formulation

Chris: Ya ya ya I am sure that is absolutely right

David: I see if I got a pretty good example here of where we need to innovate to be able to handle cargo efficiently by water and in-fact if we invent we can do that so that it is cost effective who will be able to send so many places in the world that would be very useful. I would like to do a study on New Zealand I know that people are talking about the useful, people have told me that obviously about New Zealand and so many places have water they produce if the technology was there

Peter: Yes, I mean this study we are talking about could apply almost to anywhere I mean especially places where is regional hic up.

Chris: Which is actually another reason I think why what we are talking today about is very interesting, In some areas there are some complicated issues here but they do are potentially a global significance because if we can crack on here, then other areas of similar restrictions on marine frame could benefits from what we do.

Peter: Thailand is a good example.

Sapna Chacko: Further investigation

Chris: Further investigation we are doing a certain amount I mean David and I are already looking at something around the North Devon area where we have been talking with Tim. Tim's study is very much involved with that foreign issue down here. And he thinks, it will go through but it's been called in, but it has to be called in because it has to be called in. but he thinks diminish all and get go ahead but meanwhile time passes. So, investigations it seems to me the key is relatively to identify the investigation is how would you get these data

David: Yes, that is a good point. We need the cost. Shipping cost, worldwide cargo in containers to places in CAD. And the other-way around

Chris: And how many people are actually shipping in and out, not just on full loads but on you know in general.

Peter: I mean after all somebody in Exeter wants to export something they probably get the container in from Exeter or Felixstowe and from Felixstowe going to Montreal or somewhere like that or going to America there are lots of cost involved in the chain and they are very complex, container people know all about it and they got lots of people sitting there analysing the cost in just a competitive strategy. They analyse sea freight the same, inland freight the same, they may even lose money on one element and make money on another one, because they

are quoting 1500 dollars and but even you don't know how much is the inland, how much is transport, how much is the handling cost, how much is profit or you don't know what is the profit. It is very difficult.

David: The cost of a lorry moving from Felixstowe to Bristol is seven hundred pounds but going out to Plymouth is 1240 then off-course you have the booking cost then you have the handling cost, at both ends(Yes you have and look after the container cost and to ship has to pay the wharfage and customs) the costing can come up with effectively and economically of-course we can. Innovation rather we can get figures and challenge it and is what we are doing is we can make a prediction of how the cost of road transport is going to increase must be increasing really for the last 20 or 30 years which going to get even worse, these are the figures that they are with the government that using water freight is a very good thing

David: The trouble is at the end of the day the government are not going to use are they? is probably some shipping company, or some person who take the risk

Paul: prepare to take the risk

David: That is alright there will be financial side really the government can influence on it. But the situation government has faced. I think the bill is certainly twice, three or four times bigger than the Mod. Cost at the moment is escalating, government cannot continue to invest at this increased level of our roads' needs. I mean Devon will tell us the maintenance of the road is 10 million pounds behind at the moment. It is huge.

Chris: I mean there is potentially an INTER-REG programme with French because Brittany suffers for some time

Paul: Just going back to the investigation got two areas there, individual bespoke opportunities, opportunities such as the inter- point the business and then we got the continues in-fact opportunity such as things they are trying to pay and they are all in a different directions, petroleum so there will be a sort of areas and

state of needs to be collectible and think will be a value and trying to assess the needs for it , and of course the opportunity through the feeder traffic where we got to develop the act ,because we have limited our ports facilities extendable in Falmouth and Plymouth are still limited in many ways without some rather expensive infrastructure costs. And if we have to avoid them in the initial stages I would have thought that is really captive someone. What Tim has done is develop the berth for the cements on the Plym. (ya ya ya) It will be dredging nevertheless

Chris: What we are talking about I have got a voice mail come through. Torbay is very keen on marine projects so if we came up with good schemes he would certainly bank it. I think we are going to call it and tie it up actually (yes) because of time limit (yes) have you got everything you need (Ya almost) see if you feel if you still lack on something contact me (yes I will) I think this has been an interesting conversation from us as well you know I think we made us sort of concentrate on our minds on an issue I think some of us were talking about this already but it was a useful forum.

David: Yes definitely

Paul: Yes

David : we talked about this couple of years ago did we

Chris: we did and we need to keep it

David: The trouble is we get the generality and then we don't get down to specific because that is quite a big job now, you know what generalities are.

Paul: My personal view is today or tomorrow or in ten years' time twenty years' time the opportunity for the feeder traffic on a port within the CAD area I think could be positive despite the fact that container business is such a mess

Ian: I agree absolutely

Peter: There is an additional link for feeder service I mean people sending stuff,

David: Passenger service

Chris: Yes absolutely, but actually I am separately working on a cruising idea you know to bringing in specific again something which is by northern council south west because she is based in northern council. She is a French woman called July Besell and there is a INTER-REG project on the go in with association of ports in Brittany. I am looking forward for that. And also, something Torbay are very keen on it.

Paul: I think there was a super programme on the Tely the other night the actually looking at the sort of the poor-man's passenger ship, Cruise ships, Chris: Oh I didn't see that. Do you know that on whit Monday in 1911 there were only 11000 passenger movements across the peer.

Sapna : So thank you very much for your time

Chris: Sorry it took a while to organize, it is been an interesting and useful conversation.

Sapna: thank you very much for your time and you support for this focus group.