SOCIO-ECONOMIC ASPECTS OF COMMERCIAL PORTS AND WHARVES IN SOUTHWEST ENGLAND: A GROUNDED THEORY APPROACH TO REGIONAL COMPETITIVENESS

by

SARAH JANE TUCK

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Abstract

SARAH JANE TUCK

Socio-economic Aspects of Commercial Ports and Wharves in Southwest England: a Grounded Theory Approach to Regional Competitiveness.

The Southwest Region, as defined by the SW Regional Development Agency, forms an extended peninsula with a coastline of 1,020 km, the longest of any region in England. All along this coastline are fishing ports, commercial ports, small wharves, closed ports, ferry ports and leisure ports. Amongst the smallest are a dozen tidal ports, tiny harbours and rocky wharfs that still maintain a commercial trade of local and environmental significance. According to most theories of port development these ports should close, being forced out of business by larger, more efficient ports.

Semi-structured interviews were conducted with fifteen people who were involved with five small ports or port areas in the Southwest region. They represented commercial, local government or local resident interests. The research was carried out using grounded theory methodology, which aims to create theory through inductive analysis of the data.

An ecological theory of port competition emerged, which explains how a small port succeeds because it is adapted to a market niche within which it enjoys a unique competitive advantage. Small ports are, however, extremely vulnerable to relatively small changes in the external environment, especially as port town land has a high opportunity cost in terms of the housing, retail and leisure developments that could profitably be made on the land. The institutional environment (including the support of the local council) and economic environment are the two most important indicators for the success or failure of a small port.

In terms of regional competitiveness, a small port contributes to the competitiveness of its region as a business in the traded sector and a facilitator of traded businesses. In terms of clustering, a small port appears to belong more to a cluster of industries around agricultural products, fish products, supplies distribution, wholesaling transportation and logistics services, than to the obvious 'marine' clusters of ship fabrication or marine leisure.

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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 research award without prior agreement of the Graduate Committee.

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Signed ......S.S. T.I.............

Date ...30 July 2007...

Chapter 1 Introduction to the Research

1.1 The Nature of the Research

This thesis presents the results of a research project investigating socio-economic aspects of small commercial ports and wharves within the Southwest region of England. Many of these ports are presumed to be *economic drivers* for their hinterland (that is, the port transmits economic growth to the adjacent land area) (English Nature 2003). They service short-sea shipping, especially in the bulk shipping sectors. They are also bound up in a dynamic local web of cultural identity and sense of place (Meyer 1999).

There is a surprising lack of substantive theory relating to small ports. They are often unglamorous, with an old-fashioned image (European Union Commission 1999). Taafe, Morrill and Gould's model (Taafe *et al* 1963) of hinterland penetration and selective success, describes the withering away of small ports as large ports grow. Similar models show the same process (Rimmer 1967, Bird 1971, Hoyle and Charlier 1995). Early predictions of container port development also came to the same conclusion, although from an argument based on automation (McKinsey and Company, Inc. 1967). These assumptions inform port policy (Comtois *et al* 1997). Nonetheless, small ports (such as the ports studied within this report) exist and thrive even today. They do so by concentrating on *bulk cargoes* (commodities transported in an undifferentiated mass, without packaging) and serving a limited *hinterland* (the market area for a port). This possibility is acknowledged by Bird (1971) but there is no theory concerning the factors that lead to success or closure of the small port. Most recent research, theory building and testing has concentrated on medium and large ports, especially container terminals. Such research frequently ignores the societal aspect of a port. Very small ports are embedded into their communities at the local level, and like all ports, they facilitate market access for businesses in their regions.

1.1.1 Small Commercial Ports and Wharves in Southwest England

For the purpose of this research, the southwest region of England is defined by the boundaries of the Southwest of England Regional Development Agency (SWERDA). Regional Development Agencies (RDAs) are non-departmental public bodies, established by Act of Parliament in 1998, which aim to co-ordinate regional economic development and improve their region's competitiveness in a sustainable manner (DTI 2006). SWRDA stretches from the Isles of Scilly to Gloucestershire on the north coast and Poole on the south coast (See figure 1.1).

Key:

1. Bristol
2. South Gloucestershire
3. North Somerset
4. Bath and North East Somerset
5. Swindon
6. Bournemouth
7. Poole
8. Torbay
9. Plymouth

Figure 1-1 County and Unitary Authorities within SWRDA

Source: Southwest of England Regional Development Agency 2006

The extended Southwest peninsula covers local economies that vary from the prosperity of Dorset to the poverty of Cornwall and the Isles of Scilly. The coastline has a length of 1,020 km, the longest of any region in England (South West UK Brussels Office 2006). All along this coastline are fishing ports, commercial ports, small wharves, closed ports, ferry ports and leisure ports. The largest port is the Avonmouth and Royal Portbury Docks estate near Bristol, where there are proposals to build a new deep-water container quay and yard. Poole and Portland in the south are also expanding. These are ports of national importance. The smallest are a dozen tidal ports, tiny harbours and rocky wharves that still maintain a commercial trade of local and environmental significance. It is these ports, set into a framework of local and regional planning and socio-economic importance, which form the focus of enquiry.

1.1.2 The research problem

Small ports date from a time when roads were slow and difficult. They declined in economic importance for the first half of the twentieth century, as the internal combustion engine became king (Trethowen 1971). In 1947, the National Dock Labour Scheme was created in Britain as part of the post-war settlement. It only applied to the main ports at the time. This, together with the additions of the 1966 Docks and Harbour Act and the 1972 Jones-Aldington Agreement, produced labour rigidities that distorted the economic growth of ports in the UK, strangling the Scheme ports while boosting the trade of small or new, non-scheme ports that could work flexibly and reliably (Rayner 1999). The abolition of the Dock Labour Scheme in 1989 led to the closure of a number of small ports, but others have carried on into the twenty-first century. They now have a renewed importance as nodes in a network of sustainable, short-sea transport. However, most of the focus of research into short-sea shipping has been concentrated on containerised break-bulk freight and roll on-roll off cargoes for "motorways of the sea" (European Union Commission 2001a). Within the United Kingdom (UK) there is little academic research on the bulk ports and bulk coastal trades. There is minimal theory about either their economic importance or their effect on the communities within which they lie.

The European Union has attempted to bring in a Ports Directive without success (Stares 2006), but a Maritime policy to achieve the objectives of sustainable economic growth is being formulated in Brussels (European Union Commission 2006). A Ports policy for England and Wales is presently being prepared (Department for Transport 2006a) and a Marine policy is under discussion (DEFRA 2006a). Information for planners and practitioners is needed to ensure that small commercial ports can play their part in sustainable transport and regional growth and competitiveness.

1.2 Aims of the Research

This research has three aims:

- To explore the social and economic environment of small ports and wharves in the Southwest of England
- To determine why, if present theory predicts that small ports will wither away as large ports grow, there are small ports and wharves in Southwest England that appear to be thriving
- To find out how the commercial ports and wharves within the Southwest of England (assuming they have a viable future) can best contribute to the competitiveness of the region

Regional competitiveness is not an exact concept (Charles and Benneworth 1996) but within this research project, it is interpreted as being about the socio-economic health of a region compared to other regions within a country or economic bloc (see chapter three). Because of the wide variation in size and type of wharf and port within the region (including leisure ports, fishing ports, commercial ports, car terminals, ferry terminals, oil terminals etc.) the research has been focused on to small commercial ports and wharves (with less than one million tonnes per annum cargo throughput in 2002) handling dry bulk goods. These are the most common type and there has been little research into their role and future.

1.2.1 Research Objectives

The objectives of this research are:

- To categorise by size and type, and examine, the ports of Southwest England
- To examine the concept and identify the determinants of port and regional competitiveness: to use these as a starting point for the collection of primary data
- To select and apply an appropriate approach to theory-building in order to create theories concerning the contribution of these ports to the socio-economic condition of the region
- To compare those theories with the existing theories in comparable areas
- To draw conclusions about policy and commercial implications of supporting the contribution of such ports towards regional competitiveness

1.2.2 Research Hypothesis

Inductive research does not commence with a formal hypothesis to be tested. It creates hypotheses that are then tested against the data they are drawn from (Sarantakos 1998). However, the very nature of this research implies a basic hypothesis that both the social and the economic environment are important to a port's regional competitiveness. Hypotheses that are more developed will be found in the results and conclusions to this research.

1.3 Research Methodology

This research is exploratory in nature because of the lack of previous work in the area. Bird (1971) laid down the foundations of modern port theory with his Anyport model. In 1992 UNCTAD published its Three Generations model of port development which has since been refined and developed (Beresford *et al* 2002), but this is a marketing concept. Much further theoretical work has been done concerning container ports and port development, but the small, bulk, first generation port has continued since Bird's time with little or no theory attached to it. In addition, the social setting of *small* ports is not well understood, although there is extensive work on the history, planning and urban renewal of large ports.

Because the research is exploratory, an inductive approach was taken. As noted earlier, this means that, instead of postulating a hypothesis based on literature and then testing it, this research attempts to build theory from the data. It is qualitative research because this provides rich, detailed data from only six cases.

Grounded theory was chosen because it is an inductive and systematic methodology; it is generally used with qualitative data; and it is well suited to exploratory research. Grounded theory was 'discovered' by Glaser and Strauss in the 1960s during their sociological studies of attitudes to dying in American hospitals. Its use has spread since then to a number of disciplines including business (Locke 2001).

Because of the importance of 'fit' in grounded theory (Glaser and Strauss 1967 p. 3) a comprehensive literature search before starting to collect and analyse data is discouraged. The researcher is encouraged to enter the research field with a completely open mind except for 'research sensitivity', that is, enough knowledge to ask useful questions. The theory will then fit the data, rather than the data being forced into the shape of pre-existing theory. However, there is a presumption that the researcher already has a research question and has a point of entry into the data gathering process (Locke 2001). The researcher needs enough information to know what the research question is, how to narrow it down to a manageable size and where to begin (Strauss and Corbin 1998). For that reason, a short literature review relating to post-war British ports policy, European Union (EU) ports policy, short-sea shipping, Southwest ports and the issues of ports and regional competitiveness was conducted before data collection commenced. The apparent determinants of a port's regional competitiveness were found from relevant literature, and then port capacity was (initially) used to operationalise (that is, turn into a measurable form), the concept of the contribution of ports to regional competitiveness.

The primary or new data was collected by interviewing individuals who were key stakeholders, including the port manager, harbour master, pilot, port user, local authority officer, local politician or local resident within six small, bulk ports or wharves in the Southwest region of England. In traditional research, sampling uses probability to select a representative sample of the population under study. In qualitative research, on the other hand, sampling is normally non-probability (led by the emerging research findings) (Sarantakos 1998). Theoretical sampling (a process in which discoveries direct the researcher to the next area of inquiry or potential data source) is used for grounded theory research (Glaser and Strauss 1967, Locke 2001). The initial questions were based on exploring decisions relating to the capacity of the port and on the determinants of regional competitiveness. The first interview subject was chosen as being representative of the concepts under study. The choice of subsequent interviewees and the questions posed were guided by the early results of the analysis. Then the interviews were transcribed. They were analysed manually by labelling data fragments (the labels arising out of the fragments, not pre-conceived) and then copying fragments onto data cards, grouped under the label. These data cards then formed the basis for the formation of categories and higher orders of concepts and theories. Memos were written to explore categories and to theorise, based on the emerging information. Secondary sources were analysed alongside the primary data to provide different "slices of data" (Glaser and Strauss 1967 p. 65) to yield more information on a category.

The process of analysis was complete when no new concepts were emerging, at which stage a second literature review was conducted based on the results. This explored the issues that had arisen, relating them and testing them against existing theories and ideas. The results were then obtained and conclusions were drawn.

1.4 Outline of the Research Report

The standard model for presenting deductive research consists of a literature review, followed by an explanation of the methodology, then data collection and analysis (Mauch and Park 2003). Such a model follows the process of deductive research. In order to show the process of an inductive, grounded theory research project, this report should have consisted of a brief preliminary literature review, followed in the normal manner by an explanation of the methodology used. The analysis and principal literature review would then have to be shown entwined in an extended section before a final review of the literature and results. This would make for an inelegant presentation, difficult to follow and understand. Many reports on a grounded theory research project use the conventional format of a literature review before the analysis and results (Saldivar-Sali 1998, Ashill 2003). This report follows the logic of the actual course of the research project more closely. However, the next chapter presents a traditional review of the history and theory of ports' socio-economic development in Britain and especially in the Southwest of England, although the review was not in fact carried out until near the end of the research. Its function is to set the scene for the reader.

Chapter three contains the pre-analysis literature review, which shaped the research aims and guided the initial point of entry into data collection, together with an update of some of the issues. It presents the UK and EU policy environment for ports. *Short sea shipping* (the movement of freight along coastal and inland waterways, generally in smaller ships that do not cross oceans) and its role within the sustainable transport agenda of European maritime policy is also considered. The small commercial ports of Southwest England are listed with a brief background. Finally, there is a review of the history of regional economic policy and the literature concerning the concept of regional competitiveness, which is then applied to the ports sector.

Chapter four follows, which deals with the research methodology. The use of grounded theory is justified and explained within the context of the present research. The research setting is given in detail, ethical considerations are looked at and the treatment and analysis of data is explained.

The analysis has been divided into three chapters. A very short chapter five explains the gradual evolution of categories and broader concepts for the data, and presents the final ordering of the data in tabular form. These categories and concepts are from the *findings* of the research, induced from the data. The overall analysis has three concepts, but these are interrelated. The headings are:

- The working port
    - Cargoes and value-added services
    - Port competition and port choice
    - Ship size, harbour structure and dredging
    - Ownership and control structures
    - Finance, planning and regional context of development

- Social and Political
    - Negative environmental issues concerning small ports
    - Positive social and environmental features
    - The sense of public 'ownership' of publicly used spaces

- Port closure
    - Factors leading to closure
    - The process of redevelopment and regeneration
    - Marina development

An unavoidably long chapter then analyses the categories relating to a working, commercial port. Here the analyses of primary data and secondary data are presented alongside each other. The analysis of primary data is in the form of the memos written throughout the analytic process. These memos are coding memos that interrogate the properties of categories, and theoretical memos that create higher order linkages and concepts from the data. They are organised by category, and then by interview within a category. Alongside the memos (where appropriate) is a review of secondary data pertinent to each category of analysis and an analysis of comparisons drawn during the research (a standard grounded theory technique for opening out the properties of a particular category, see Strauss and Corbin 1998).

Chapter seven is rather shorter and continues the analysis, but of categories relating only to a port that closes. Ideally, with three concepts there would have been three chapters of analysis (a single chapter being too large). The problem lies with the overlapping of categories between the three concepts. That is why a simpler division was made, into the working and closing ports.

Chapter eight completes the analysis at the highest level of abstraction, that of the major concepts produced during the course of the research. There is a discussion of the research, an examination of the limitations of the study and recommendations for further research.

Chapter nine is a brief conclusion that summarises the results and includes the practical implications of the research results for policy and for those working with small ports. There is also comment on the use of grounded theory methodology for this type of research.

Chapter 2 The Socio-economic Development of Ports in Theory and Practice

2.1 *Introduction*

This chapter explores several models of port development within a European historical framework, which moves from the dawn of European seafaring to the present day. It follows three themes, based on the three interlinked areas of 'the commercial port', 'public and politics' and 'waterside regeneration' from figure 5.2 and table 5.1. The development of the interrelationships between a port, the region it serves and competition with other ports in the same region is reviewed to illuminate the present situation of the modern commercial port. The development of the social and political relationship between a port and its town or city is followed as an aid to understanding the 'public and politics'. The physical development of a port is also examined in theory and practice, showing how it has led to the release of port land for waterside regeneration in recent decades, even without port closures. Examples from Britain and especially from the Southwest are given.

2.2 *Models of Early Port Development*

This section examines the Anyport model of the early development of ports (Bird 1963, 1971) in conjunction with a model of cityport development (Hoyle 1988, Pesquera and Ruiz 1996).

2.2.1 The First Ports

The earliest days of seafaring in Western Europe began in the Mesolithic period in the eighth or seventh millennium BC. There was a land bridge between Britain and Europe at this time, which was broken by the rising seas about 7000BC. From then onwards, all traffic with the Continent required at least a crossing of the Dover Straits. There were no ports, as such. Boats were shallow-bottomed, made of hides, and propelled by oars as sail technology had not been discovered. These early sailors used the landing places provided by nature, either beaching on soft sand or mud or anchoring off the beach with natural stone anchors. They needed sheltered natural harbours with a good holding ground or a safe beach (McGrail 1992).

By the Bronze Age, international maritime trade between the Southwest of England and the Continent was well established. Boats were still made of hide or of planked wood and they had sails. Mount Batten in Plymouth Sound was an established landing place where tin, copper and lead was exported and European and Mediterranean luxuries were imported. Most of the trade at this time, though, would have been coastwise trading. For port calls, the ships would have been carried far upriver on the incoming tides to settlements that lined the fertile river valleys. At the highest tidal point they could sit on mud as the tide went out to load and discharge directly to labourers and packhorses.

Tin from the Southwest continued to be an important metal into the Iron Age. During the first century BC some of the principal routes for trade and the movement of people lay between the Southwestern ports of Mounts Bay (near Penzance), Plymouth Sound and a port near Hengistbury Head in Dorset (Poole harbour), and ports in France such as St. Malo and the river ports on the Loire, Gironde and Seine. The Roman invasions into France and Britain in the first century AD diverted trade to the Southeast and changed forever the importance of ports in the Southwest (Salway 1984, McGrail 1992). London was built as a city on the north bank of the Thames at the point where it was still tidal for inbound ships, the Thames could be crossed and the confluence of the Walbrook with the Thames made a natural landing place. During the reign of Nero (died AD 68), a timber quay was built above and below the bridge, consisting of a wall of timbers braced back into the riverbank. This was the first phase of the development of a recognisable port. Cargo was probably landed here from lighters, which loaded and unloaded ships that were anchored in the river (Portcities 2006a). At Exeter a Roman fortress was built, which was serviced by a port on the tidal river Exe. These were newly developed and important ports, established by a colonial power to serve their needs but with a lasting effect on the patterns of trade. Exeter remained more important than Plymouth for centuries afterwards (Kowaleski 1992). Bristol was established in a highly defensible position upriver of the gorge of the river Avon and serviced Roman settlements such as Aqua Sullis, or Bath.

	Era	***Terminated by the epoch of …***
I	*Primitive*	The overflowing of the port function from the *primitive* nucleus of the port, or the change in location of the dominant port function
II	*Marginal quay extension*	The change from a simple continuous line of quays
III	*Marginal quay elaboration*	The opening of a dock or the expansion of the harbour
IV	*Dock elaboration*	The opening of a dock with simple lineal quayage
V	*Simple lineal quayage**	The provision of oil berths in deep water
VI	*Specialised quayage*	The occupation of all waterside sites between the port nucleus and the open sea

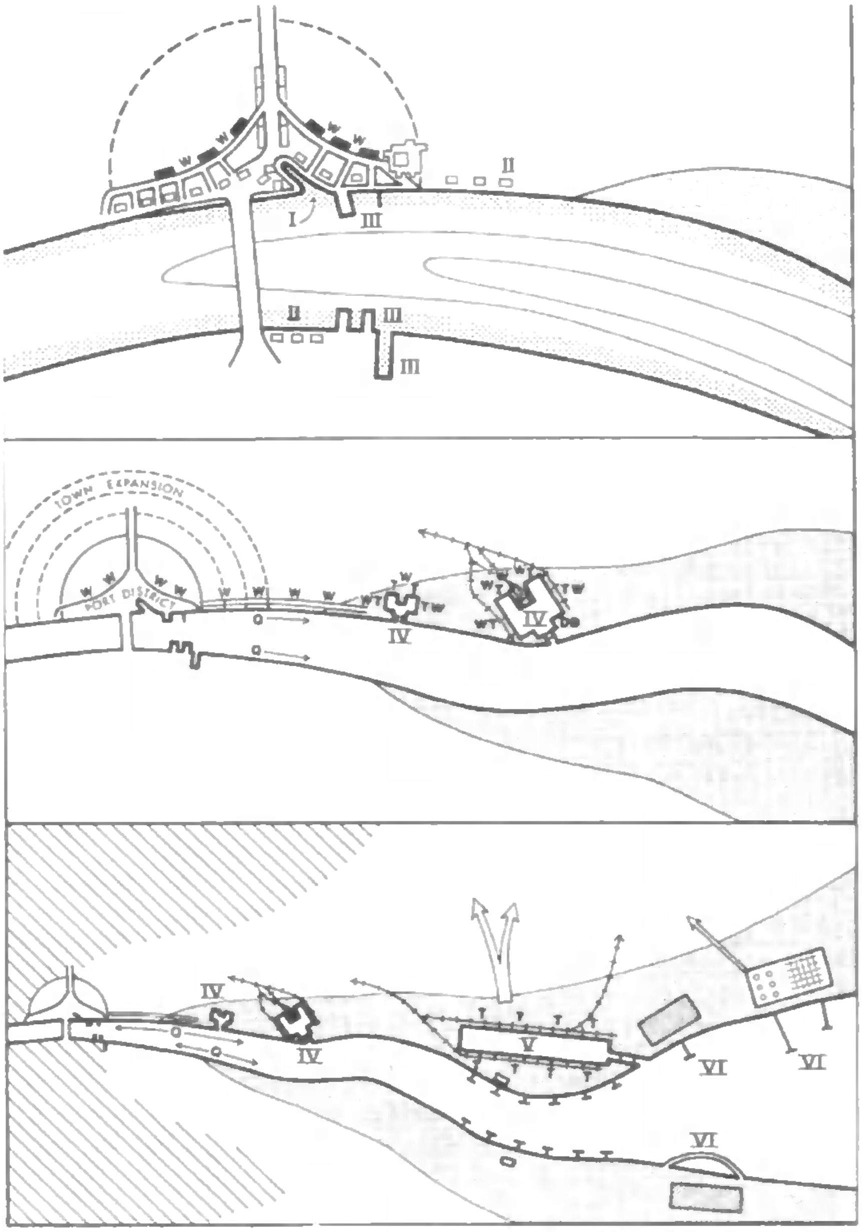
Figure 2-1 The Six Phases of the Anyport model

*Minimum requirements for *simple lineal quayage* have been empirically derived from a study of the development of actual ports. They are as follows: 500m of quay in one uninterrupted line, and 9m minimum depth alongside, with an approach channel of minimum depth 9m; if the quay is in an impounded dock, the entrance lock should be at least 250m long.

Source: Bird 1971 p. 68

Bird (1923-1997) studied the development of London and other ports in the 1960s and produced his classic "Anyport" model to describe six different phases of a port's development (figure 2.1). 'Anyport' port is situated at an estuary head with a tidal range of more than 5m, and came into being when an appropriate authority proclaimed it as a legal port. The first phase (described above) was identified by Bird as 'primitive'. Each new stage moved further downriver from the highest crossing point (Bird 1963). This insight concerning the downriver development, in stages, of a historic port was not new. Sargent in 1938 describes the developmental phases of that port at the confluence of the rivers Hull and Humber now known as Hull, and goes on to remark that "Similar conditions are to be found in many estuarine and river ports" (Sargent 1938 p.20). Bird's contribution was to create a formal model with distinct phases of development. The Anyport model is the foundation work of modern port geography and it retains a profound effect on current thinking about ports and port development (see figure 2.2).

The second phase of port development began at London possibly in about 120AD when the waterfront below the Walbrook was extensively developed out into the river (Schofield 1999), although Bird dates it to 200AD. This is the stage of 'marginal quay extension' when the waterside quays extend (usually downstream) beyond the city walls. The Romans were masters of the art of harbour building, having inherited the skills of the Phoenicians and Greeks. They knew the secret of making cement that would set underwater, a secret that died with them until the invention of Portland cement in the early 19th century (Pannell 1963).



Top: I The primitive port
II Marginal quay extension
III Marginal quay elaboration
W Warehouses
------ Semicircular town wall with stronghold where the wall meets the estuary downstream

Centre: IV Dock elaboration area
DD Drydock associated with later docks
Q Continuing marginal quay extension
T Transit sheds
W Warehouses

Bottom: IV Dock elaboration area, as centre
V Simple lineal quayage
VI Specialised quayage
T transit sheds, or in the river, jetties serving a continuous frontage of industry

Figure 2-2 The Six Eras of Anyport

Source: Bird 1971 pp. 70-71

The end of the Roman Empire in Britain was marked by pirate raiding and a general disruption of trade. It is possible that at this time goods from the Southwest were carried on coastal ships to the Southeastern ports of Ipswich, Southampton and London to be transhipped for export to the new trade destinations of Denmark, Frisia and northern France (McGrail 1992).

Alfred the Great (849-899) began the creation of an English monarchy in the ninth century. By the end of his reign he had established peace and prosperity, aided by the first English navy, which gave the capability to engage the Viking raiders. Trade expanded in the ensuing peace. After King Alfred gave some land on the Thames to his brother-in-law, the Archbishop Ethelred, there was built the first artificial embayment at Ethelredshithe (later re-named Queenshithe after Queen Matilda). This remained a dock in commercial use until well into the twentieth century, see figure 2.3 (Portcities 2006b). This was the third phase of development, 'marginal quay elaboration'. In most ports with a smaller trade than London, it did not occur until the expansion of trade in the nineteenth century.

Figure 2-3 Queenhithe dock in 1923

Source: National Maritime Museum (Eager Collection), Portcities 2006b

2.2.2 Medieval Ports

In the Southwest during the medieval period, Bristol in its secure position was the most important port, with Exeter and Christchurch lagging far behind, and the remaining ports yet further behind, especially in Devon and Cornwall where the wool (the most important export of medieval England) was of poor quality (Kowaleski 1992). Pirate raiding remained a problem up to Elizabethan times and even beyond. Dartmouth and Plymouth were important only as embarkation points for troops and supplies during the Hundred Years War.

Developments in ports and shipping were incremental in the period between the tenth century and the end of the seventeenth century. Hoyle (1988) calls this the 'primitive cityport' when the port and city are intertwined (see figure 2.4).

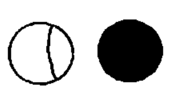
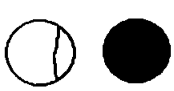
Stage	Symbol	Period	Characteristics
I Primitive cityport		Ancient-medieval to 19th century	Close spatial and functional association between city and port
II Expanding cityport		19th- early 20th century	Rapid commercial and industrial growth forces port to develop beyond city confines, with linear quays and break-bulk industries
III Modern industrial cityport		Mid – 20th century	Industrial growth (especially oil refining) and introduction of containers and ro-ro facilities require separation and increased space
IV Retreat from the waterfront		1960s – 80s	Changes in maritime technology induce growth of separate maritime industrial development areas
V Redevelopment of the waterfront		1970s - 90s	Large-scale modern port consumes large areas of land- and water- space; urban renewal of original core

Figure 2-4 Stages in the evolution of the Port/City interface

Source: Hoyle 1988 p. 7

Pesquera and Ruiz (1996) also began their survey of port cities in this pre-industrial era. Society was still agricultural in nature with production mainly intended for consumption. The limited surpluses were traded in local markets as land travel was difficult and slow. International trade grew during this period but not at such a pace that it required a step-change in port technology. The main problem was the silting up of many smaller, inland ports such as Rye in Kent and the Otter estuary in Devon. Local communities struggled to raise money to repair and extend the wooden quays and tidal basins (Youings and Cornford 1992). In the 1560s the first pound lock waterway in England was built. This was the Exeter ship canal, which was intended to bring trade back up to the city for the first time since the Earls of Devon had blocked the river with fish weirs in the fourteenth century. Topsham had become the port for Exeter, but the city remained in control of that and all the ports of the Exe estuary and collected customs dues from as far as Teignmouth. The ship canal did not live up to its name, being shallow at high water and the entrance drying at low water, but goods were brought up from Topsham to be landed at the new stone wharf, to be entered at the Customs House (Youings and Cornford 1992, Hardcastle 2006). It is easy to see the money invested by Exeter and other, more rural ports, in fighting the effects of fish weirs, silting and a gradual increase in ship size as a wasteful battle against the inevitable. Hill (1999) uses the example of Dumfries, which, like Exeter, had a port that was difficult to reach and many outports, to argue that access to the sea and shipping in an age of poor overland links allowed the town and its hinterland to develop and expand until road and rail could take over. When coastal shipping was the main highway, port spending ensured economic survival.

Pesquera and Ruiz (1996) make the point that the port and city at this time were physically, culturally and economically interrelated. Fishing, trade and overseas or marine warfare were all important to the economies of coastal communities with most of the population directly or indirectly dependent on the sea. The very symbols of the city were maritime. Dartmouth was an extreme example of this with, in 1377, 22 per cent of the householders calling themselves shipmasters and 27 per cent of householders were known to have travelled overseas. The 'common seal' of the town showed a ship. The personal seals of its citizens also tended to be decorated with symbols of boats, anchors, masts and sails. Dartmouth had 213 ships in Royal service in the late fourteenth century (Kowaleski 1992). This intimate involvement in the sea continued and indeed grew as trade grew during this period. A visitor to Plymouth in 1669 observed, "The life of the city is navigation" and "only women and boys are to be seen; the greater part of the men living at sea" (Fisher 1992 p.234). The city was also involved in the administration of the port and in raising funds for work on the port infrastructure (Pesquera and Ruiz 1996).

2.2.3 Ports and the Industrial Revolution

The fourth stage in the development of Anyport (Bird 1963) and the second phase of city port development identified by Pesquera and Ruiz (1996) and Hoyle (1988) is associated with the Industrial Revolution that began first in England in about 1760. Bird calls it 'dock elaboration' and for most ports it was manifest in the building of a wet dock protected by a pair of dock gates, where ships could lie always afloat, although they might have to wait until near high water before entering and leaving. Some care should be taken with interpreting the model, however, as sometimes it is the *extension* of port development that marks its shift to another phase, sometimes it is the *function* and sometimes the *form*. In each case, however, it is a reflection of change in servicing the needs of ships and trade. Hence, changes in structural technology and cargo handling techniques are incidental to the model as they simply reflect the needs of the ship form and the trade. For example, with both Bristol and Hull, their first wet dock was also their first dock, and so marked the shift from the end of the marginal quay extension era for Bristol, and the end of the primitive era for Hull.

The very earliest rectangular wet dock, with floodgates that could be closed during low water, was built at Rotherhithe on the Thames at Howlands Great Wet Dock, which was begun about 1696. This was not a 'legal quay' (for Customs purposes) from which cargo could be unloaded. Instead, it was planted round with trees and offered shelter to ships waiting in the River or fitting out. Because its function was not related to cargo, it does not represent a change of era. The first commercial wet dock was built by Thomas Steers in Liverpool and opened in 1715. It was constructed in the mouth of the Pool, an inlet from the Mersey, it was rectangular in form and could hold 100 ships (sailing ships commonly berthed several abreast with cargo carried by hand across the intervening decks). It was an instant success as ships could unload throughout the day instead of waiting for high tide and as a result trade rapidly increased (Physick 2001).

The impetus that led to the innovation of a wet dock was Liverpool's growing trade with the American colonies and with the West Indies. Along with Bristol, Glasgow and Whitehaven, Liverpool was perfectly positioned to engage in the new, westward trade, exporting goods from the evolving industrial heartlands of the North and Midlands in exchange for the cotton, sugar, tobacco and other produce of the New World (Langford 1984). Other wet docks were built at Leith (the port for Edinburgh) in 1720, Hull in 1778, the West India Docks in London in 1802 and Bristol in 1809. At Bristol the new 'floating dock' just 'locked in' a whole section of riverbed. Construction work included a new channel for the river Avon and a feeder canal to maintain the water level in the floating dock. Until then the ships had berthed along the riverfront and grounded at low tide (figure 2.5). The West India Docks on the Thames was a true 'dock elaboration' with many elaborate finger jetties to increase the number of berths. It consisted of an import and an export dock with space for more than 600 ships (Portcities 2006c, Physick 2001 and McNeill 1997).

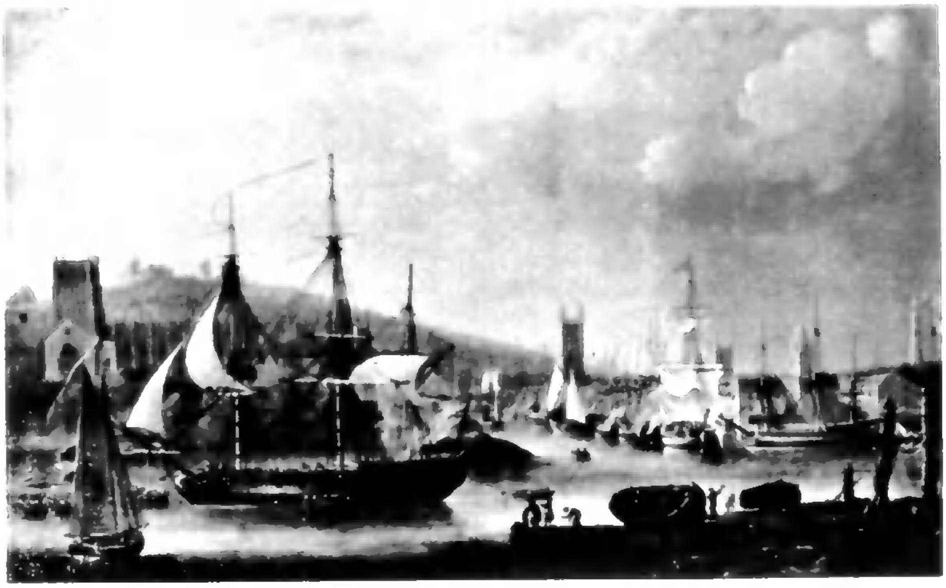


Figure 2-5 Bristol Harbour in 1786, by Nicholas Pocock

Source: McGrath (ed) 1972 p. 144

The industrial Revolution led to mass production of goods and the creation of a market economy. This produced an enormous increase in trade during the eighteenth and nineteenth centuries and the subsequent development of ports, which moved further and further downriver from the parent city as more space was needed for more and larger ships, wet docks and warehouses. The cities also changed, industrialising, growing as agricultural workers migrated to find work, and developing further and further inland, away from the sea. The sea no longer provided most of the work. Port management became centralised by governments that saw the national importance of ports to an exporting economy. Funds for expansion were provided or controlled centrally. The citizens of port cities became alienated from their ports (Pesquera and Ruiz 1996). This was the heyday of Empire in Britain, France and Germany when new port cities were founded in the colonies on the existing European pattern. In Australia, Canada and West Africa the colonial government simply chose appropriate sites for their new ports and then proclaimed their legal status as ports. The legal status produced the demand, which stimulated growth and further demand (Hoyle 1988).

In the nineteenth century, iron-built steamships replaced sailing ships for most international and some local trades, although small sailing ships remained commercially active in large numbers until the First World War. A few survived, still trading, until after the Second World War. The steam ships were larger and deeper than the old ships and many small ports and up-river docks were not adequate for their needs. Inland transport had also been transformed by the macadamising of the roads and the building of the railways, so that cargoes could be distributed from the port or gathered to the port rapidly and without the need to sit in vast warehouses. These technological changes led to the next phase of port development, 'Simple Lineal Quayage'. This is precisely defined as "1,500 feet of quay in one uninterrupted line and 26 feet of water alongside; if this quay is in an impounded dock, the lock entrances should be at least 750 feet long" (Bird 1963 p. 31). In London, the process of dock elaboration had continued with a number of docks being built by rival dock companies (figure 2.6). They fall into groups as follows:

- *London and St. Katherine Docks*
- *East and West India and Millwall Docks*

- *Surrey Commercial Docks (on the site of the Howlands Great Wet Dock)*
- *Royal Victoria, Royal Albert and King George V Docks (the 'royal' docks)*
- *Tilbury Docks*

(Pannell 1963 p. 14)

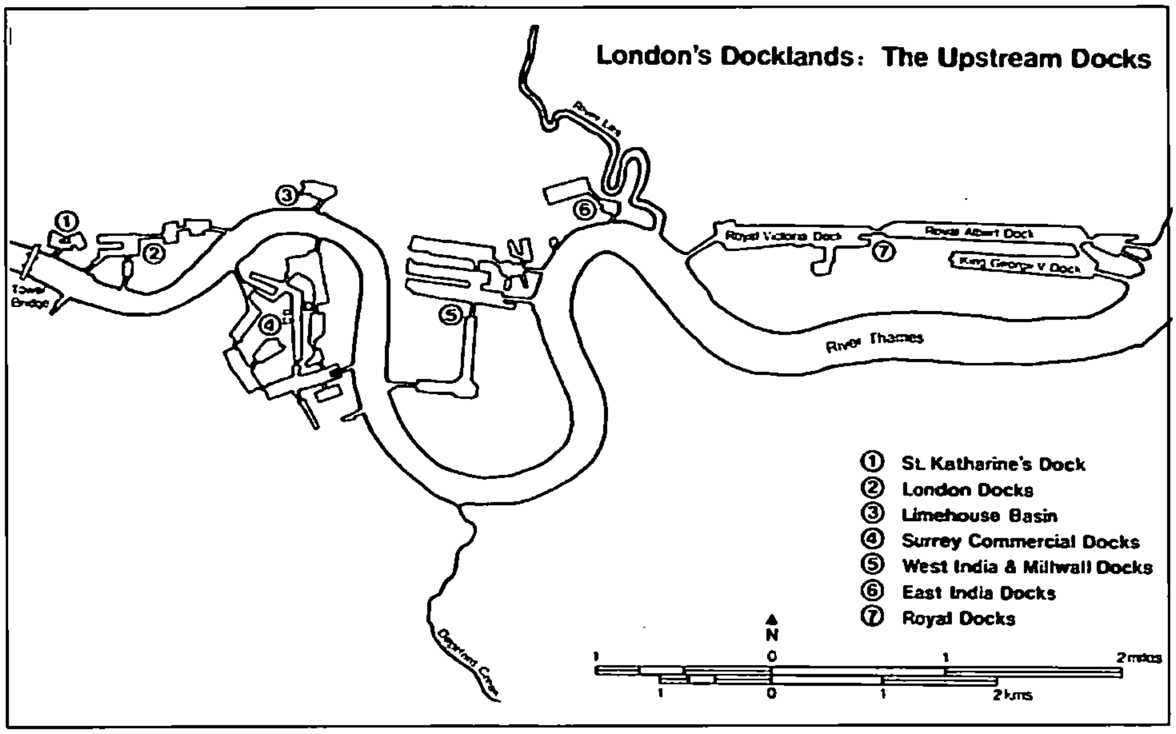


Figure 2-6 London's Docklands: The Upstream Docks

Source: Hardy 1983 p. 6

Royal Albert Dock was opened in 1880 and was the largest dock in the world at the time, able to take ships up to 12,000dwt. It was lit by electricity and had more than 5,000m of deep-water quays that certainly had more than 1,500 feet in one line but it did not meet the other requirements (Portcities 2006d). In 1886 Tilbury Dock was opened 25 miles downriver from London but the entrance lock was only 695 feet long until a new lock was built in 1929. The first manifestation of 'simple lineal quayage' was the King George V dock, built in 1921 and connected to the

Royal Victoria and Royal Albert docks. Dredging of the Thames had created a deep entrance channel and the entrance lock was 800 feet long. Later work cleared much of the elaboration from the older Royal docks, leaving them, too with simple lineal quayage (Bird 1963).

Similar developments took place in other ports during the late nineteenth centuries and early twentieth century. In 1877 the Royal Edward Dock was opened at Avonmouth with direct access to the Bristol Channel, the River Avon now being too small for modern ships. Portishead Docks were opened in 1879. These both represented 'dock elaboration', see figure 2.7.

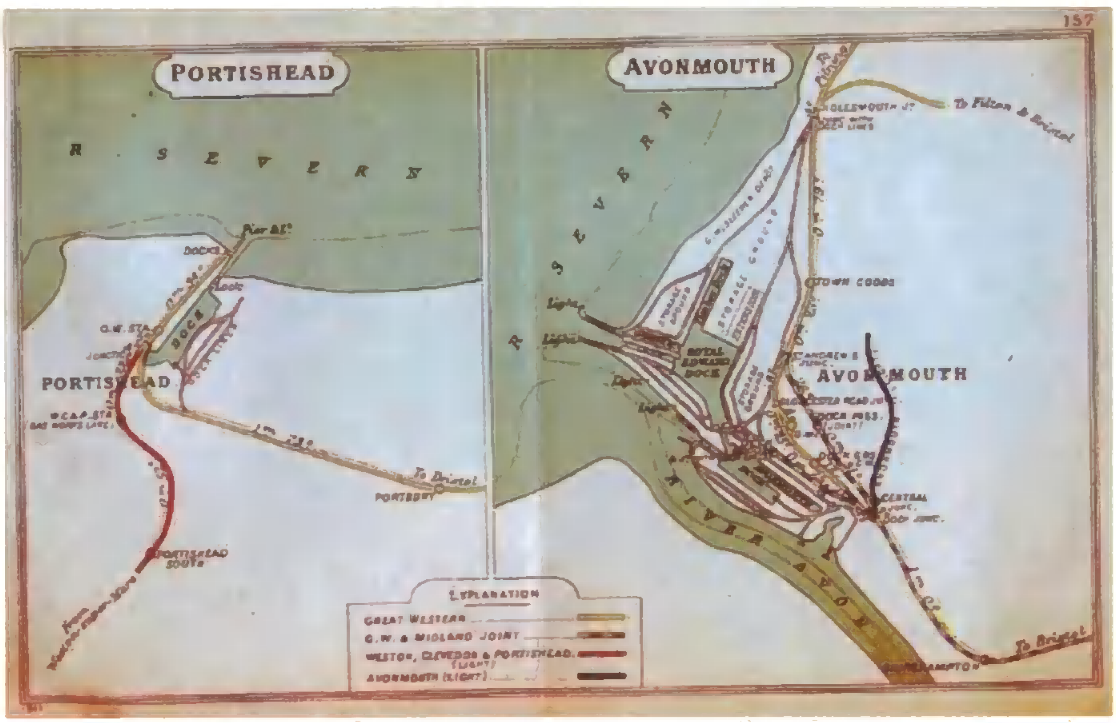
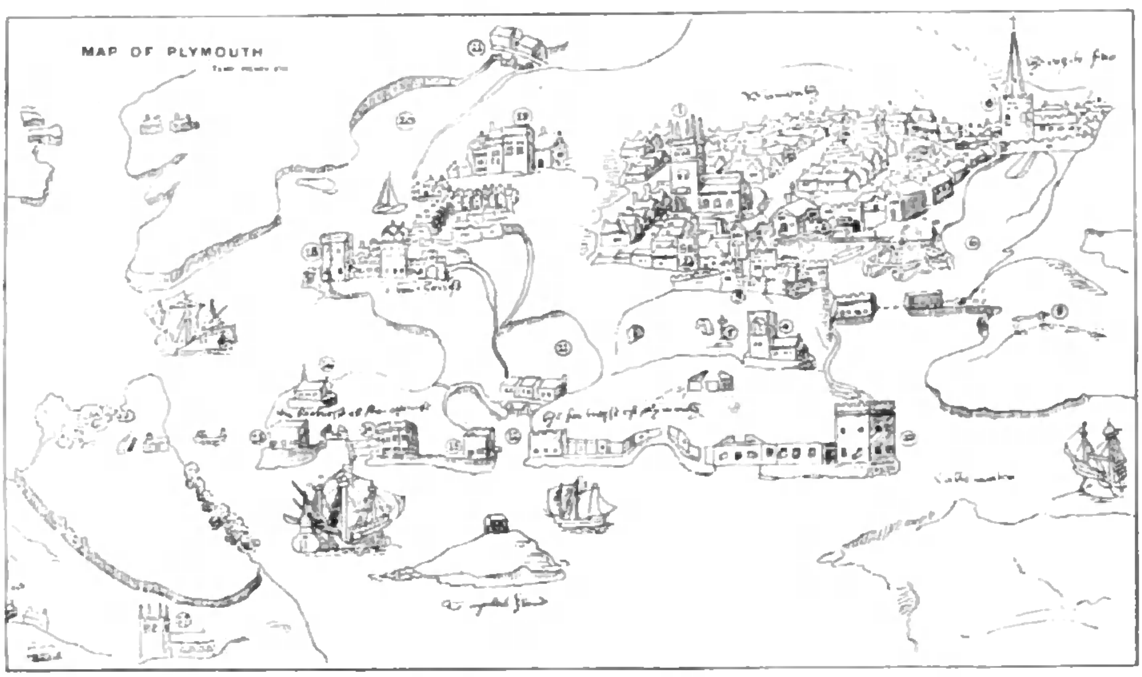


Figure 2-7 Portishead and Avonmouth in 1911

Source: The Railway Clearing House 1920 diagram 157 (as published by Tolley 2001)

Simple lineal quayage was later developed at Avonmouth, but Portishead Docks suffered from a small dock entrance and they are now closed. As can be seen from figure 2.7, the development was connected to the railway. At Exeter, Trew's inadequate ship canal had been improved and lengthened in 1701 and again in the 1820s, although by then the principal trade in woollen goods had ceased. From the 1830s onwards, various attempts were made to link the port at Exeter with the railways but the Corporation refused to allow it until 1867. By this time even the improved canal was too small for large ocean-going steamships and Exeter dwindled to a coasting port. The last trade was in bulk petroleum but that ceased in 1972. The very last commercial ship to use the canal was a sludge tanker that operated until 1997 (Hardcastle 2006). In the meantime a new dock had been built at Exmouth in 1870, connected to the railway, but it suffered from occasional bad storms that breached the dock wall and there was never the investment to make it a significant port.



Map of Plymouth, *temp.* Henry VIII.

KEY
1.—St. Andrew's Church.
2.—Franciscan Friary (and, possibly, "Black Friars.")
3.—Old Plymouth Castle.
4.—St. Katharine's Chapel.
5.—Hoe Cross.
6.—Sutton Pool.
7.—A Market Cross (?).
8.—Carmelite Friary.
9.—Gibbet.
10.—Blockhouse, Lambhay Point.
11.—Sourepole.
12.—Millbay.
13, 14, 15.—"Henry VIII. Towers" at Eastern King, Winter Villa, and Devil's Point.
16.—St. Lawrence Chapel.
17.—Maker Church.
18.—Old Stonehouse Manor House.
19.—The Stonehouse "Abbey."
20.—Stonehouse Creek.
21.—Mill Bridge.

Figure 2-8 Map of Plymouth at the time of Henry VIII

Source: Bracken 1931 p. XVI

After the decline of Exeter, Plymouth became the premier port along the southern Devon and Cornwall coastline. It was blessed with deep water and good shelter, especially after the completion of the breakwater in 1841. The early harbours were bays in the estuaries of the rivers Tamar, Laira and Plym as the Sound was open to winds between East South East and West South West (figure 2.8). The Plym was navigable up to Plympton, although this later silted up from the tailings of mineral working (Pannell 1963). The Tamar was readily navigable up to Morwelham, where the nineteenth century port has been excavated and is now open to the public.

Figure 2-9 Great Western Docks, Plymouth c. 1870

Source: Baker 1976 plate 63

By 1850 the outer basin at Millbay Docks had been completed and linked to the railway that now ran to London. The inner Great Western Docks were built by Brunel and opened in 1857 (figure 2.9).

Plymouth had been granted the concession for mail to Australia in 1850 and from then onwards, the mail and passenger liners made Plymouth their first port of call for embarking and disembarking people and mail, thus saving a day on the journey to London (Bracken 1931, Starkey 1994, Gill 1994).

2.2.4 Ports and Cargo Specialisation

Shipping began to specialise from the late nineteenth century. Oil tankers were invented to carry bulk liquid petroleum products, originally bringing paraffin for lamps from the Black Sea as a superior replacement for whale oil. By the turn of the century petroleum products were needed to power motor cars, aeroplanes and ships, especially warships. The Anglo-Persian Oil Company, formed in 1909 to take over the D'Arcy concession in Persia, built its first oil tanker (the *British Empire*, of 5,500dwt) in 1916 to bring oil from the refinery at Abadan to the warships of the British Admiralty. By the end of the First World War in 1918, transport and fighting was fully mechanised, from the ambulance to the tank (British Petroleum Company n.d.). 'Specialised quayage' was needed to handle bulk liquid cargoes of all types and also bulk cargoes of grain, coal, ores, fruit, frozen products and unitised cargoes such as pallets and containers. This is the sixth and final stage of the Anyport model as propounded by Bird (1971).

Because of the collapse of world trade between the wars there was neither the trade volume nor the finance for much port development at this time, other than petroleum jetties. After the terrible destruction of the Second World War in Europe, ports had first to be reconstructed. From 1950, trade grew with the same vigour that had triggered port investment and innovation in the nineteenth century. Increasing specialisation, rapid growth in ship size and, from 1966, containerisation of break bulk cargoes, all led to the building of larger, specialised deepwater terminals at the mouths of river systems. Rotterdam is the supreme example of such a port development. In the port of London, there was some specialised quayage in the docks in 1963 but most examples were to be found on the Thames riverside, such as the wharves at the Ford factory at Dagenham for importing raw materials and exporting cars, and the many oil installations in the

Sea Reach (Bird 1963). Nothing then or now was on a scale to match Rotterdam, which had already overtaken London as the world's premier port by 1960 (Alderton 2005). To keep up, at this as at other stages of development, a port needed the demand, the political will to build and develop, a huge financial commitment with uncertain short-term returns, and very deep water (Palmer 1999).

Plymouth had fallen behind by the end of the nineteenth century because the Great Western Dock was too shallow. A combination of a rocky bottom, Admiralty control of the harbour (the Queen's Harbour Master controls ship movements from Plymouth Sound) and allegedly an Admiralty veto on the development of manufacturing around Plymouth (to reduce competition for skilled workers for the Naval Dockyard), brought a halt to further important developments, although Cattewater Harbour was developed from the 1880s. Further development at Cattewater was blocked in 1898 by the Admiralty (Cau 1996, Bracken 1931, Starkey 1994). A petroleum importing facility was built at Cattewater about 1920. It is still thriving today, along with the import and export of bulk cargoes at the various wharves. The original Elizabethan harbour of Sutton Pool is now wholly given over to fish docks and leisure craft, although ships unloaded coal there in recent memory.

Bristol had Avonmouth Docks and built the Royal Portbury docks in 1978 in the teeth of much political opposition. These were a commercial failure at first but they have recently thrived with a number of highly specialised trades.

It can be seen from the examples above, that industrial growth and cargo specialisation have led to a concentration of modern port services into a few ports with the physical characteristics, the finances and the political will to provide deepwater berths and space for industry. Markedly in those ports, and to a lesser degree in the ones that have fallen behind, there has been an increased separation of the city and the port (Hoyle 1988 and Pesquera 1996). The developmental phases that have followed on from the last era of Anyport, and their effect on the cityport, will be examined in later sections.

2.3 Ports and their Hinterlands

2.3.1 Defining the hinterland and foreland

The hinterland of a port is the geographical area that sends or receives cargoes through the port. The idea is simple, but mapping the reality in a model port, let alone a real one, is extraordinarily complex. Sargent (1938) discussed the problems at some length and modelled the hinterland of a port that imports three commodities, see figure 2.10.

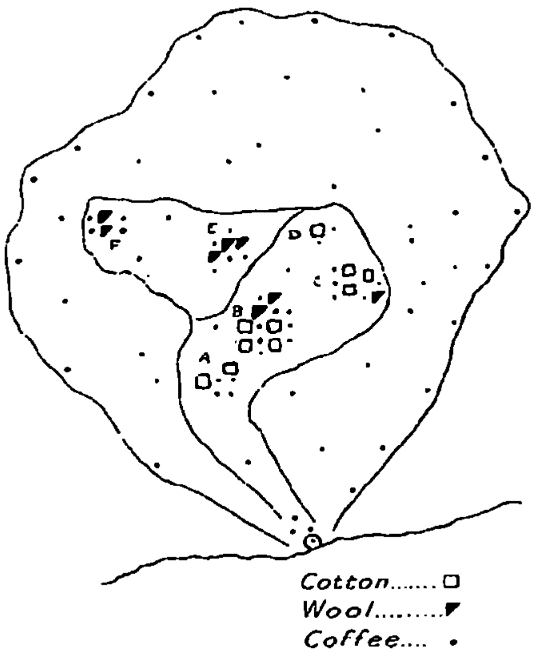
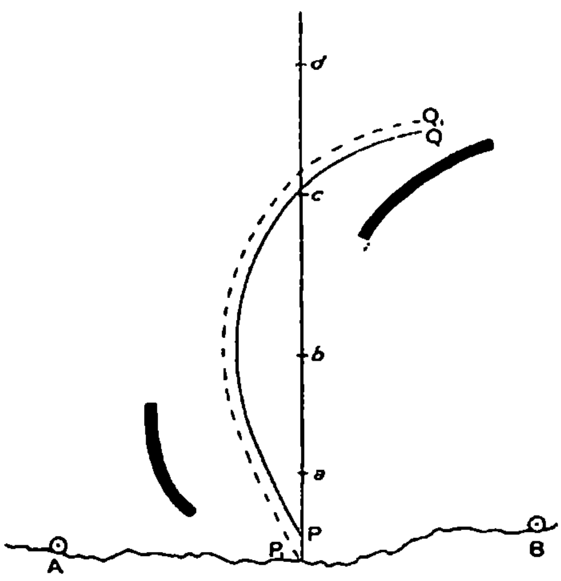


Figure 2-10 Growth of a Hinterland [through the addition of more commodities]

Source: Sargent 1938 p. 9

This model was made on the assumption of no competitors. Either areas outside the hinterland gained imports from a neighbouring, but non-competitive port, or they did without. The areas within the hinterland have little meaning, however, without some indication of the population distribution within it. With competition, such as is found in northern Europe, there is no exclusive sphere of interest. Instead, Sargent suggests that the hinterland should be drawn to enclose an area, 70 per cent of which is serviced by that port.

He then moves on to analyse the division of two hinterlands for a single commodity, explaining that differences in transport costs caused by geographical and topographical features impinging on, in this case, railway construction, will alter the line of division between the hinterlands. Differences in port technologies and markets for goods also disturb this division (figure 2.11).



DIVISION OF TWO HINTERLANDS FOR A SINGLE COMMODITY

PQ=line of division on basis of comparative rail cost only.
P_1Q_1=ultimate division due to technical superiority of port B.
=obstacles causing increased mileage cost.

Figure 2-11 Division of Two Hinterlands for a Single Commodity

Source: Sargent 1938 p 12

Sargent concludes that the term 'hinterland' is not capable of a precise, general definition, but the spatial division of a commodity between two actual ports can be depicted through port statistics. The position of small ports is also considered by Sargent. Taking the data as it was at the time, he assumes that small ports exist and are viable. Imports of goods inland of a small port but carried on ships too large for the port will be forwarded either by transhipment or directly inland from neighbouring, large ports. However, goods from other small ports could use either the small or the large port, as they must be carried on a small ship. The route taken by these goods will be the cheapest route inland from the large or small port. If the large port is congested or inefficient (especially for small ships), or the small port has a lower cost of handling because of specialised facilities (for example for bulk goods) or the cost saving of a shorter inland transport leg is greater than the extra cost of handling at the small port, then the cargo will go through the small port. The hinterland for a small port will vary with the commodity and it will be greatest for a commodity in which the port specialises.

Bird (1971 p.125) tried to give more precision to the term 'hinterland' by dividing it up into various sub-types. Most of these have not been adopted by other authors but some terms remain, including:

- 'primary hinterland' - where the port assumes a commanding role in the life of the area
- 'commodity hinterland' – the hinterland for a single commodity
- 'competitive hinterland', which has subsequently adopted the definition of what Bird rather clumsily calls 'hinterland areal overlap' – an area where there is competition for similar types of cargo from ports of the same size

Bird also refers to the *foreland* of a port, a term that came into use in the middle of the twentieth century. It refers to the areas that are on the seaward side of a port and are linked to the port by sea-going ships. Just as the definition of the word 'foreland' requires the inclusion of the transport link, so the use of the term 'hinterland' implies a landward transport link to bring cargoes from the 'back country' to the port and vice versa. It also implies either a monopoly for the port or competition between neighbouring ports for those cargoes.

2.3.2 Models of Hinterland Development

The foundation model of port hinterland development through the development of transport links was created by Taafe, Morrill and Gould in 1963 (figure 2.12). This was based on a study of colonial era port development in Ghana and explained differential development of neighbouring ports in terms of inland transport links. Another and very similar model of port development was produced by Rimmer in 1967 based on colonial port development in Australia.

These two models were amalgamated by Bird (1971) to create his own model of hinterland penetration and selective port success. From this model two conclusions were drawn which continue to influence modern thinking on port development. The first is that once a port becomes large it remains so. The second conclusion is that large ports tend to extinguish small ports. This ignores both Sargent's (1938) insight into small ports, and Rimmer's (1967) comment that smaller ports may survive the expansive and piracy phase of port development long enough to withstand competition by providing limited, specialised services for an immediate hinterland.

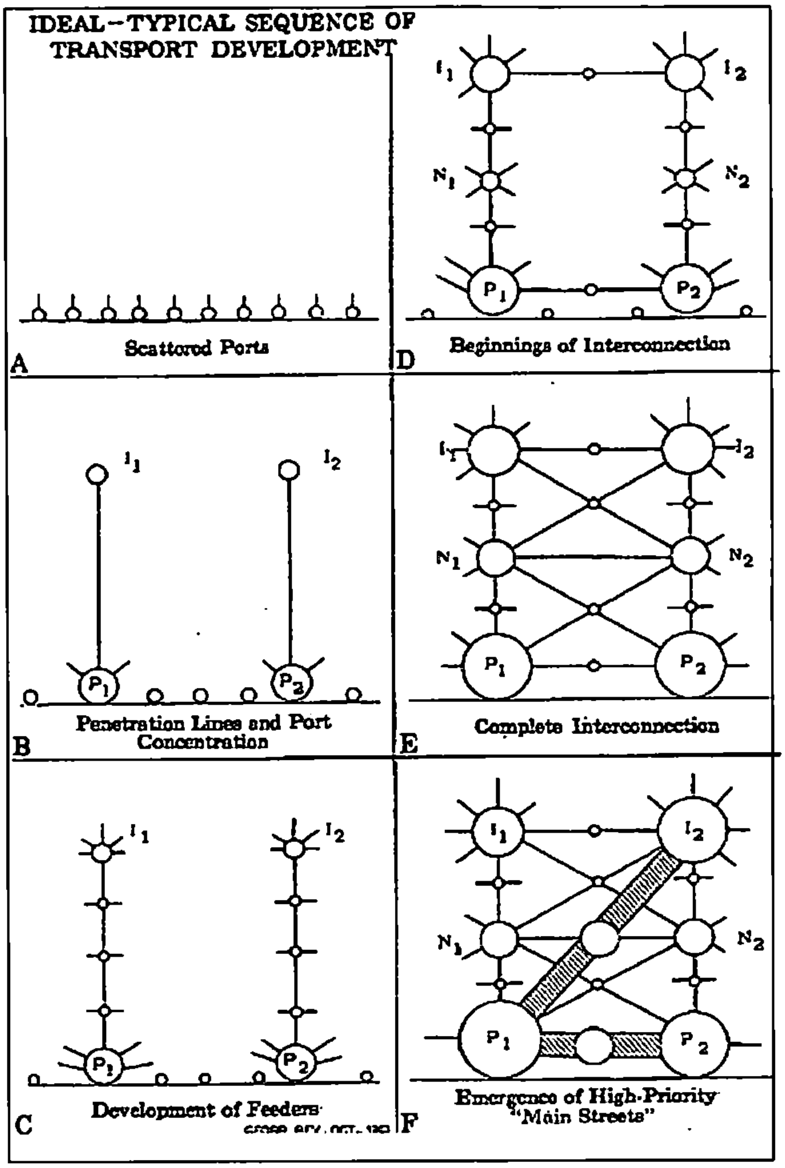


Figure 2-12 The basic Taafe, Morrill and Gould transport model of 1963

Source: Taafe *et al* 1963 p.504

A review of several models of port development is made by Hoyle and Smith (1998). It includes Vance's (1970) mercantile model, which is reviewed in chapter six. Rimmer (1977) produced a similar four-stage model to Vance although this was developed in Southeast Asian countries where a rudimentary system of markets and transport links already exists. In this case the colonial power imposes its own structures on the dependant territory.

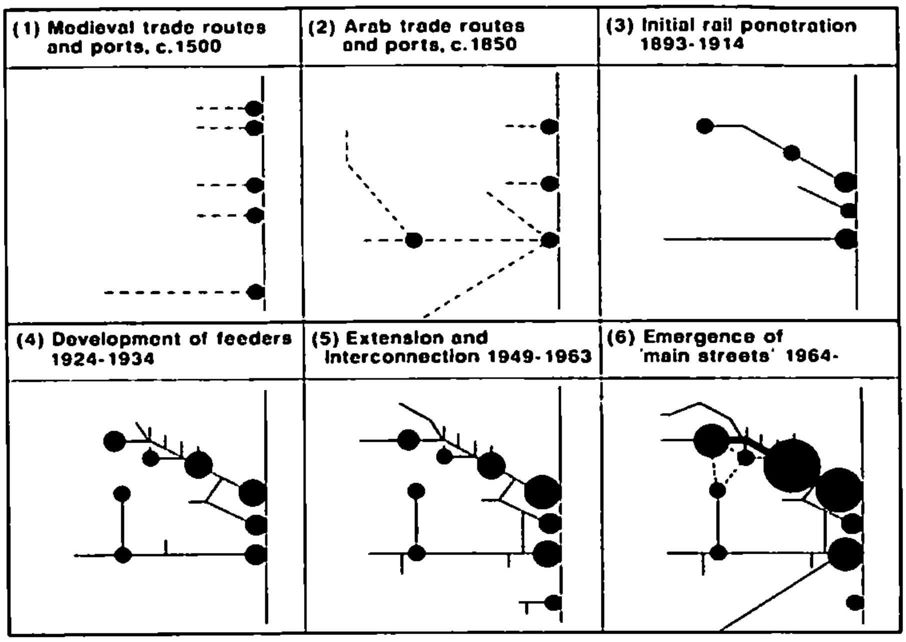


Figure 2-13 An adaptation of the Taafe, Morrill and Gould transport model to East Africa

Source: Hoyle and Smith (1998) p. 22

Hoyle and Smith also examine the Taafe *et al* (1963) model of transport and development. This was based on ports in West Africa. It has been adapted by Hoyle to East African ports (figure 2.13).

A critique of the various models (excluding Bird's 1971 model) was made by Hoyle and Smith (1998), which includes the important question of just how applicable such models, all developed in countries under colonial conditions, can be to an understanding of port development in Western Europe and indeed, to port development everywhere in the modern, globalised world. Certainly, they show a model of some elements of the past but, like the Anyport model, they do not predict the future.

In 1995 Hoyle and Charlier produced a further refinement of Hoyle's East African model which starts in about 1500 with a few coastal and one island port

(Zanzibar), connected by coastwise dhow routes (see figure 2.14). The second stage shows the brief dominance of Zanzibar in about 1850 as the chief port of a growing Arab slaving empire that was starting to penetrate and disrupt the hinterland.

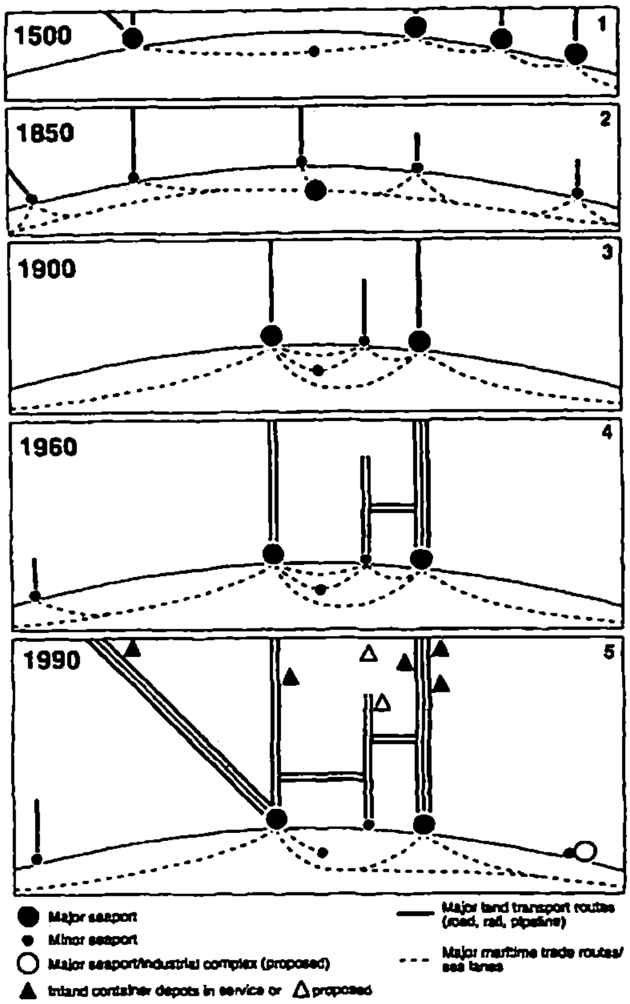


Figure 2-14 A model of port development, inter-port competition and port-hinterland relationships in East Africa, 1500-1990

Source: Hoyle and Charlier 1995

The third phase occurred because of European colonial expansion, with Britain selecting Mombasa and Germany selecting Dar es Salaam as their principal ports. The building of railways opened up the hinterland and just as in the Taffe *et al* (1963) model, the large ports eclipsed the small ports. The fifth stage is that of independence when, as in the Vance and Rimmer models, the patterns set by the colonial power endure. The final stage is dated about 1990 with a transmodal extension of the hinterland and the introduction of inland 'dryports' to serve the new container terminals. Hoyle and Charlier (1995) conclude with the observation that ports become large because of investment in the port and port-connected transport infrastructure, although a port without any competitive advantage cannot thrive no matter how much money is thrown at it. They also write about the continuity of past and present factors that affect a port's development. Another way of explaining port development would be to say that it is path-dependant, that is, the past shapes the future irrevocably. Finally, they make the point that port development is part of a dynamic interaction with other ports and with the greater political, technological and economic forces that shape the human sphere.

This review of models of hinterland and foreland development will close with a very simple model presented by Rodrige *et al* (2006). Following Bird's (1971) division of types of hinterland, they refer to the primary hinterland as the closest cargo generating area to a port, and the competitive hinterland as that area over which the port will compete with other ports. They also show the foreland as part of a continuing chain of transport from the hinterland, rather than a separate entity (figure 2.15).

In the modern world the concept of a port's discrete hinterland is questionable (Slack 1993), as even a port with a national monopoly such as Mombasa, is now competing with Dar es Salaam for cargoes from Uganda, Rwanda and Burundi (Hoyle and Charlier 1995, Hoyle 2000). The concept of a foreland has had little theoretical study although it is used at a practical level by ports, especially in their marketing (Rodrigue *et al* 2006). If the terms hinterland and foreland do now have a theoretical validity it must be as part of a single, almost seamless, transport service.

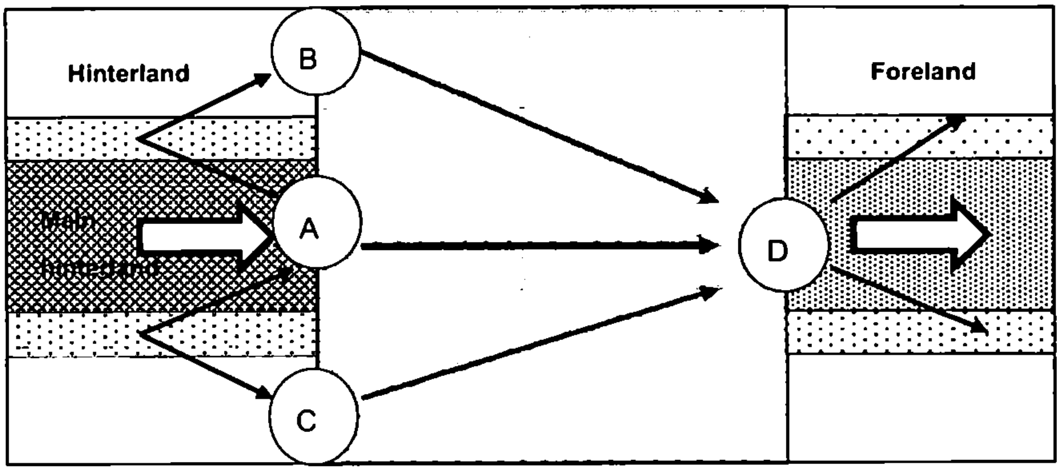


Figure 2-15 Port Foreland and Hinterland

Source: Rodrigue *et al* (2006) p. 136

2.4 Ports and Industrial Development

In the period of reconstruction following World War II, port industrial areas were deliberately used as a catalyst for economic growth, part of a 'growth pole strategy' of regional economic development (Parr 1999). Various models were used in Continental Europe and the Far East, and they continue in developing countries today. The best-known model is the Maritime Industrial Development Area or MIDA, which represents the culmination of the Anyport specialised quayage phase of development. In a study undertaken on behalf of the British National Ports Council (Peston and Rees 1970), the MIDA was defined as comprising a port with 15.2m of water depth alongside the berths and at least 2,000 ha of land available for industrial use.

2.4.1 The MIDA port

Several factors led to the birth of the MIDA port. The first was the need for reconstruction after the enormous material damage caused during World War II. This reconstruction was financed (in continental Europe) by the Marshall Plan and government spending on planned programs of growth. The second factor was the move away from using raw materials in Europe (Japan had always lacked them) and the importation of substitute materials from abroad. Where bulk, low value goods must be transported by several modes (land to sea and then land again), costs rise sharply at the modal change point. It therefore makes economic sense to bring the processing plant to the port and thus eliminate the inland transport cost of the bulk materials (Hilling and Browne 1998).

The third reason, which drove the spatial requirements of the MIDA port, was the growing importance of oil (Hanappe and Savy 1981). The specialised quayage phase of port development had started in the early twentieth century with the building of oil terminals. Oil consumption grew even during the inter-war recession and more so during the war when access to oil was seen by both sides as vital for eventual victory. After the Second World War, motoring increased and power stations began to switch from burning coal to oil. The world became dependant on the massive and cheap oil fields of the Middle East. These were controlled by the seven major oil companies (known as the Seven Sisters, they were British Petroleum, Royal Dutch Shell, Mobil, Esso, Texaco, Chevron and Gulf Oil). These oil companies ran all aspects of production, transportation, refining and distribution of petroleum and its products. They had an industrial fleet policy, controlling the tanker market by owning a substantial portion of it and chartering in more on long-term time charters. In 1950 the cost of transporting oil from the Middle East to Western Europe was half the delivered price, so any measure to reduce transport costs increased profitability (Stopford 1997). A ship could double in size but keep the same number of crew, and also reduce the relative amount of steel to build her and relative fuel consumption (due to the cube law, which says that the volume of a cylinder will increase with increased radius by a factor of three but the perimeter will only increase by a factor of two). These economies of scale led to the oil companies demanding ever-larger ships, driving the shipyards to acquire larger building slips and to technical innovation. Those ports that imported bulk crude oil had to dredge their channels and find land for their tank farms (Hanappe and Savy 1981). These advances made it feasible to increase the size of dry bulk shipping as well.

Only a few ports had the capital, political backing and demand conditions to support very large ships. The port of Rotterdam began a programme of expansion in 1947, immediately after the reconstruction of the pre-war port. The first phase was the Botlek development, completed in 1958. The Europoort development followed. This began as a plan for an oil terminal but it grew in scale when the Suez crisis, with further political unrest in the Middle East, combined to make both larger oil tankers and refinery facilities in Europe more desirable. An ore harbour was added to this site, with a steel works next to it (Pinder 1981). This was the first generation MIDA, known as the Rhine model (Vigarié 1981).

In Rotterdam, the Maasvlakte land reclamation project at the mouth of the New Waterway represented the third and final phase of expansion, bringing the land area up to 10,000 ha in size. Similar MIDAs were developed in France (where they were known as Zones Industrielles Portuaires or ZIP), Germany, Belgium, Japan (where they were known as kombinato) and South Korea but not in Britain (Vigarié 1981). These projects all involved the industrialisation of existing large ports.

Japan also created the 'developer port' on green field sites in regions with little existing industry (Olukoju 2004). Many attempts have been made to quantify the effect of these ports on regional development (Olukoju 2004, Pollock 1981, Vigarié 1981 and Suykens 1989). In general, the results have been positive although there is some evidence that the new port industrial areas simply caused a re-location of existing inland industry to the new maritime site. This resulted in a net gain for the region but not necessarily for the nation. There is also evidence that ports without a good hinterland in terms of demand and transport will not create the desired linkages within the local economy. Instead, the finished or partly manufactured goods are simply re-exported. The size of the investment may also be important, with lower-cost terminal building for a single commodity (the model adopted in the UK), not able to attract secondary industries nor provide the critical mass in terms of services that is needed for a growth-pole (Pollock 1981).

No MIDA has been built in the UK. There was a lack of political will to spend scarce resources at a time when the Welfare State was being set up at home and fighting in the Korean War, the Malayan emergency, Suez, Kenya, Cyprus and Aden and later, Northern Ireland all had to be paid for. The British government also tended to view ports in micro-economic terms as businesses, rather than as state-owned assets for the public good and greater economic development (Pollock 1981). Finally, Britain may not have had the necessary scale of demand because its ports lacked both the huge physical hinterland of the Rhine or France, and the commercial hinterland that early membership of the European Economic Community would have conferred.

Vigarié (1981) recognises a second generation of MIDA development starting in about 1970. In both Europe and Japan, public opinion swung away from support for large, heavy industry projects. Pinder (1981) has charted the change in community attitudes that led to the rejection of Rotterdam's Plan 2000+, a grandiose scheme for expansion into the agricultural districts south of the port. There were concerns about the environment and about the quality of life for residents. In Japan, there were calls for expensively reclaimed land to be used for residential and community purposes. The pace of economic growth was also slowing: in 1973, the world was plunged into both recession and inflation when the oil price was sharply increased. Because of these changed economic and social conditions, the second generation of MIDA development included more warehousing, light industry, and facilities for the emerging containerised market. Recession slowed the pace of growth but it did not stop it (Vigarié 1981).

The third generation of MIDA port identified by Vigarié (1981) is similar to the Japanese developer port because it is situated in areas of low industrialisation, within developing countries. In this case, however, the intention is to bring the production facility closer to the origin of a commodity, before ocean shipment rather than after. These involved smaller land areas than the European model and the port development included facilities for export of the raw commodity as well as the processed goods. Some bulk goods needed to be imported to provide energy or additional inputs to the process. Vigarié postulated a fourth generation of MIDA in developed countries, with a core of heavy industry but also high technology manufacturing, assembly of semi-finished goods and urban facilities. However, the current move in the developed world has been towards de-industrialisation, with an increasing emphasis at ports on distribution and logistics services. The MIDA concept is alive and well in the developing world, though. One example is the new deepwater port and 11,000 ha industrial development zone (IDZ) at Coega near Port Elizabeth in South Africa. This will combine facilities for bulk, break-bulk and container ships, with a cluster of metallurgical industries at its core (Coega Development Corporation 2004).

2.5 After Anyport: Containerisation and the Retreat from the Urban Waterfront

The prediction made by the Anyport model was that the Specialised Quayage phase would end when the entire waterfront, from city centre to the sea, was taken over by port activities. This was based on the situation on the Thames where upriver berths were extensively used by lighters to land cargo transhipped from the more modern berths downriver. In between, berths made obsolete for ocean-going carriers were used by coastal shipping. It seemed logical that this pattern would continue. Container shipping had been invented before the Anyport model was first published by Bird in 1963 and it had come to Europe before that publication was repeated in 1971, but it would be easy to dismiss container terminals as just another form of specialised quayage. Easy, but wrong. The container revolution ushered in a completely new phase of port development and accelerated a retreat from the urban waterfront that had already begun with the MIDA ports.

2.5.1 The Container Revolution and Port Competition

Prior to containerisation, break-bulk shipping was labour intensive because most cargoes had to be manhandled from the ship's hold to the derrick hook and from the quayside to the warehouse. Most ports were highly unionised with restrictive work practices. Ships took days or even weeks to load and discharge. Rates of damage to and theft of cargoes were very high. (Donovan and Bonney 2006, Beresford *et al* 2004). On the other hand, ports provided employment for the city and the dockworkers were in intimate contact with the ships they serviced. They were part of a maritime community. The advantages of unitised loads (including ro-ro, containers, pallets and rail wagons) are speed of handling, rapid turn-around of ships (which earn no money in port) and protection of the goods from loss.

The container revolution began on the 26th of April 1956 when 58 truck trailer bodies were dismounted and loaded as 33 ft boxes onto the deck of the *Ideal X*, a converted tanker. The *Ideal X* sailed that night from New York to Houston after taking less than eight hours to load. This was the inauguration of a regular coastal service by Pan-Atlantic (later Sea-Land), under the vision and leadership of Malcolm McLean. In 1957, the first cellular containership entered service (with the containers loaded into the hold and held in place with vertical steel bars to keep them in their cells). In 1958 Matson Lines, inaugurating an independent container service to Hawaii, installed the first shore side, specialised container crane on a strengthened quay (Donovan and Bonney 2006).

Containerisation came to Europe in 1966. Several American companies started trans-Atlantic services and a number of British carriers formed two consortia (ACT and OCL) to establish container services between the UK and Australia. A new European consortium, Atlantic Container Line, began a successful trans-Atlantic service in 1967 with ships that combined roll-on roll-off facilities with containers. Europe embraced containerisation with enthusiasm, building container terminals, designing container-handling equipment, readying the railways for unit train services and preparing the banking, insurance and legal environment for the nascent revolution (Tilsey 1968).

Containerisation is very capital-intensive for both the shipowner and the port. The American pioneers had access to cheap, redundant World War II ships that could be converted at a relatively low cost to create the first containerships. European and Japanese shipowners tended to form consortia to spread the capital cost of building new containerships. For the ports, they had to strengthen the quayside to take the weight of large, loaded boxes. They had to invest in container cranes and specialised handling equipment to move the boxes around the yard. They also had to find a site with enough land for handling and storing the boxes as they waited to move on the ship or away by train and truck. Finger piers, such as New York was still building, and narrow quay areas next to warehouses, were unsuitable for containers (Donovan and Bonney 2006). Ports also began to reduce the number of dockworkers at this time, but restrictive labour agreements (such as the National Dock Labour Scheme in the UK) and the ability of a highly unionised workforce to bring an import-dependant country to its knees through strike action, reduced the ability of port managements to take effective action.

The British Transport Docks Board, recognising that containerisation would bring far-reaching changes to the maritime world, commissioned a report by consultants which was published in 1967 (McKinsey and Company, Inc. 1967). The consultants used the model of other industries that had become automated after achieving a homogenous product (standard container sizes had been set by the American Standards Association in 1961 and were adopted by the International Organization for Standards in 1965: Donnovan and Bonney 2006). The majority of their conclusions were accurate. The one exception was their recommendation that economies of scale required no more than three British ports to have facilities for containers, each port serving a different foreland market. The findings of the McKinsey report were accepted by the supporters of containerisation so that the idea of port rationalisation, with only a few ports being served by trans-ocean liners and the rest reduced to coastal and bulk traffic only, became accepted orthodoxy (Tilsey 1968, Containerisation International Research 1983, Baird 2002a). This became known as the hub and spoke system, after the model widely adopted by airlines of large carriers moving high volumes between two hubs and then feeders moving low volumes between the hub and the periphery in a spoke-like system. Although the conclusion was drawn from automation, not geography, it reinforced the conclusions of the hinterland port models that large ports must inevitably take the cargoes from small ports which must then wither away or stagnate.

In practice, the early concentration of container ports did not happen (Containerisation International Research 1983, Baird 2002a). For reasons of national pride and for fear of being left behind as a failed port, state and municipal authorities in Continental Europe and elsewhere were prepared to make the initial investment in container handling facilities (Baird 2002a). MIDA ports already had the land. The way that containers were handled at these new terminals, being rapidly transferred near the berth to feeder ships, unit trains and lorries (now enjoying improved road systems after heavy investment in motorways), meant that the old lighter and coastal berths were no longer needed. The new specialised quayage had already moved out of the old port area. This was now decayed, run down and ripe for re-development. Initially, the docks were filled in (Lacey 1991, Meyer 1999). This helped to cut costs and provide funds for building container terminals in unsubsidised and private ports. The economic slowdown and reduced demand for oil that marked the 1970s and early 1980s also freed up land that had been created or set aside for heavy industry, such as the Maasvlakte development at Rotterdam. Thus, more ports than had initially been expected became container ports, able to cope with the first generation of container ships, which were little larger than break-bulk shipping. Other reasons for the absence of the expected level of port concentration were the extra cost of transhipment, the preference of shippers for direct routes, the fact that earlier containerships, although growing in size, did not altogether lose the economies of scale by calling at several ports in a market area, and the entry of new independent shipping lines via ports not served directly by the established lines within a liner conference (Containerisation International Research 1983, Baird 2002a).

During the 1980s, there were changes in ship size, in information technologies such as EDI and in effective deregulation of labour. Employment in ports shrank and the remaining jobs were more technical, with less contact with the ships especially where former dockworkers were deployed to stuffing and stripping containers in groupage depots. The privatisation of ports began in the UK, releasing the ports from constraints on raising capital. A new phase of terminal building and port expansion took place.

Port competition was intense during the 1980s and 1990s with an oversupply of both container ships and port facilities (Slack 1985, Baird 2002a, Donovan and Bonney 2006). About 1980, shipping lines, led by APL, began to embrace the concept of the logistics chain with shipping as no more than a single link in the chain (Donovan and Bonney 2006). Coupled with improvements in roads and information technology this meant that cargo could move through any port in a continent based on overall costs. The primary hinterland of a port shrank to nothing, in some cases, while the competitive hinterland expanded enormously (UNCTAD 1992, Slack 1993). Although, as already stated, most traditional ports (and some new ports, such as Felixstowe in England and La Spezia in Italy), had invested in the necessary infrastructure, those ports that could not offer a high level of service were sidelined at this time (Slack, Comtois and Sletmo 1996, Phillips 1996). UK ports in particular suffered at the start of this period because of their inefficiency and high costs, mainly due to the Dock Labour Scheme. From being a gateway and transhipment point for goods moving from North America to Europe in the years up to containerisation, they rapidly descended into an outpost of Continental ports after containerisation. The only exceptions were non-scheme ports such as Felixstowe (Asteris 1990). Even ports that could provide good service were at the mercy of shipping lines that had to constantly switch their ports of call and adjust their networks in response to new lines, new alliances, and mergers and takeovers (Slack 1985 and 1993, Slack *et al* 1996).

Hub and feeder systems did develop, most notably in the Far East where Hong Kong and Singapore competed for first place in terms of the highest volume of containers (measured in Twenty foot Equivalent Units, or TEUs). However, even here many secondary ports were utilised by ocean carriers (Robinson 1998). At the end of the 1990s several new hub ports were developed to maximise their strategic position on the high-volume east-west routes. These included Gioia Tauro on the toe of Italy, Algeciras at the entrance to the Mediterranean and Salalah in Oman. Through a combination of strong investment (often including the carriers, who received exclusive or priority use of a terminal in exchange), efficiency and political stability, these hub ports are able to operate successfully and without any natural hinterland of their own.

Hub and feeder networks are part of the logistics chain concept in container shipping. This may be seen as the latest stage in port development, where the port is a node in a seamless chain from manufacturer to retailer. The unopened, multimodal box that is a container is one prerequisite for such a chain. Another is the information technology that allows logistics firms and transport providers to plan and optimise routes and loading, track and trace boxes on their journey and monitor inventories throughout the chain. The final requirement is for an efficient distribution and processing system at the point where the goods leave or enter their container, which increasingly will include reverse logistics for obsolete goods. These services can be provided at the port or close to the final customer. Pesquera and Ruiz (1996) argue that the modern port can both grow and re-integrate with its city to some extent through the service sector. The logistical and warehousing sector can provide a 'clean' transition space between the 'dirty' port and city residents. It also offers jobs to offset the loss of employment from a traditional port. In return, the city can offer high-level services such as banking, insurance and information technology that will give the port a competitive edge. Beresford *et al* (2004) argue that ports need to integrate their services and work together within the port community to provide the service levels needed for logistics operations. A 1992 UNCTAD report produced a three generations model of port development in which the third generation is a logistics centre where information flows are as vital as cargo flows. This model has been widely disseminated and criticised (Beresford *et al* 2004), but it should be appreciated that it provides marketing concepts, not a model of port development. In a fiercely competitive environment, the port needs to market itself and can do so effectively with the label of a third generation port.

A superior model that specifically updates Bird's 1963 Anyport model has been produced by Notteboom and Rodrigue (2005). This simplifies Anyport to three stages of setting, expansion and specialisation. The fourth stage then becomes one of regionalisation, where the port is linked to inland freight distribution centres through rail and inland waterways (figure 2.16)

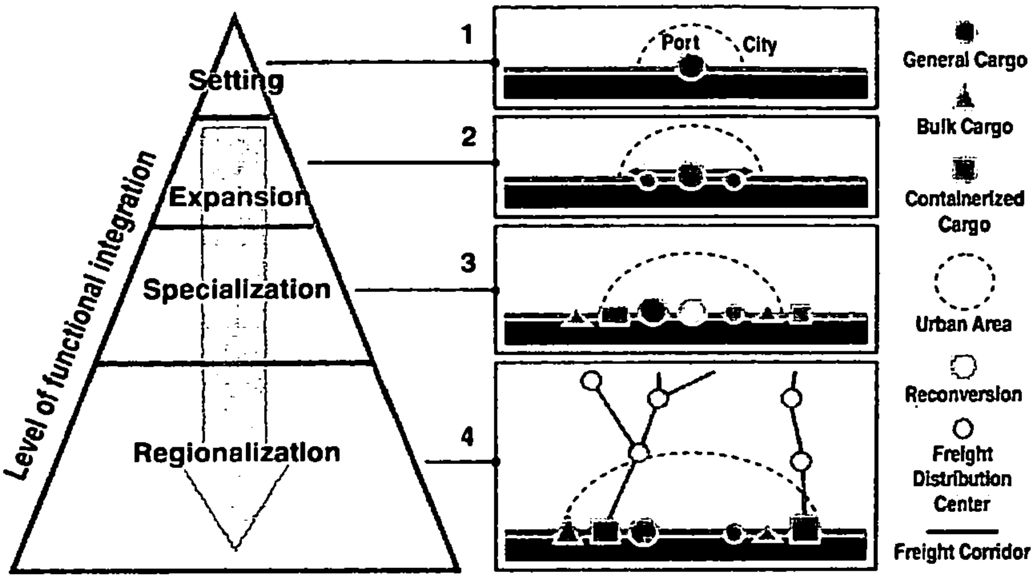


Figure 2-16 The evolution of a port

Source: Notteboom and Rodrigue 2005 p. 298

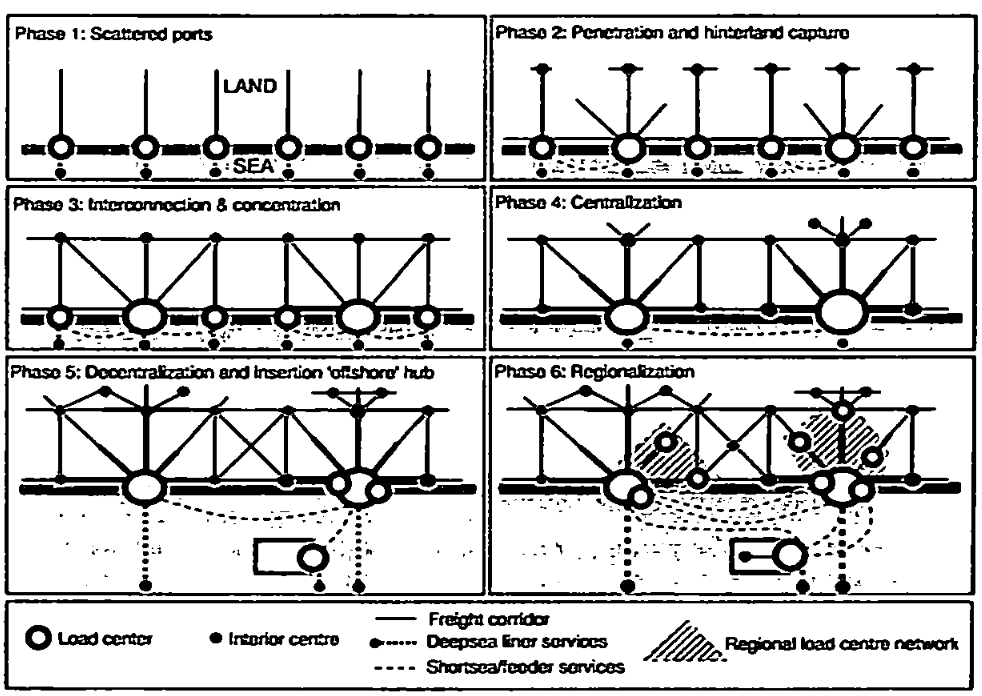


Figure 2-17 The spatial development of a port system

Source: Notteboom and Rodrigue 2005 p. 300

Notteboom and Rodrigue also update the models produced by Taafe *et al* (1963), Barke (1986) and Hayuth (1981). Their new model includes an offshore hub port and a regional load centre network (figure 2.17). The load centre network emerges as an answer to constraints on road traffic to and from a port and a lack of land at the port. Multiple load centres also serve the different distribution needs of different product channels.

Container shipping grew in size from its earliest days, not steadily but in a series of spurts as technology or demand conditions allowed (figure 2.18). The figures from 1996 and 1997 relate to ships built by Maersk, which tends to under-report the sizes of its ships (Donovan and Bonney 2006). In August 2006 the Emma Maersk was launched with a declared nominal capacity of 11,000TEU, although theoretical capacity could be as high as 15,000TEU (Porter 2006). It is noticeable that the rate of growth in ship size has accelerated sharply from the late 1990s to the present day.

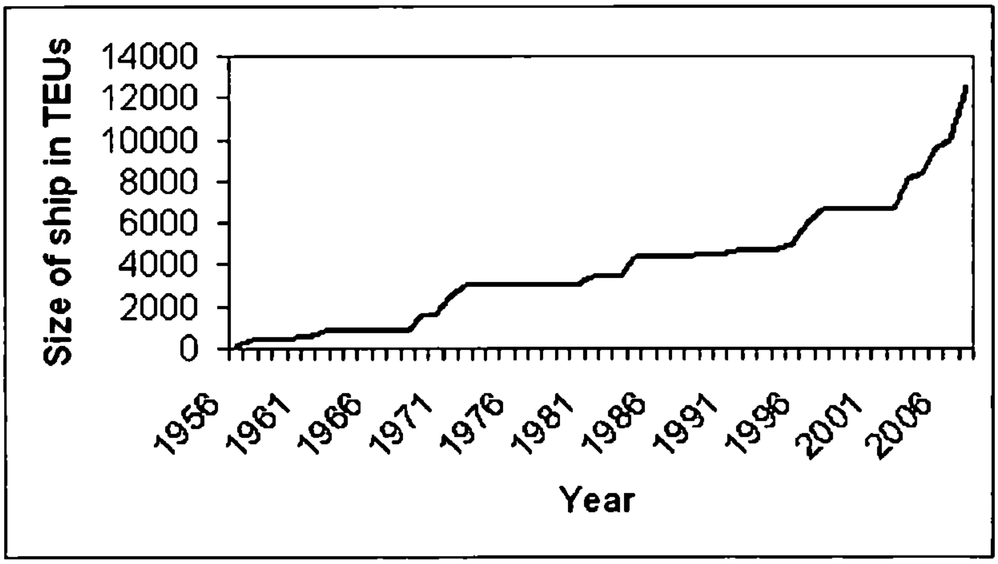


Figure 2-18 Largest Containership in Service 1956-2007

Source: Compiled from Donovan and Bonney 2006 and Wikepedia 2006
(2007 value based on reported building orders)
Analysis of the trend shows that it is exponential with a value of $y = 485.13^{0.0637x}$

where y = size in TEU and x = time in years (R^2 = 0.86). A simple forecast shows containerships breaking the 20,000TEU barrier by 2013. However, the lesson from increases in both tanker and dry bulk ship sizes in earlier decades is that demand conditions and operational constraints (namely time in port and landside storage of cargo before and after loading) provide a natural cap to ship size at some point. Since containership size broke the 6,000TEU barrier in the late 1990s, there has been more talk of concentration in port calls (Baird 2005). Ship owners with very large ships (who themselves are consolidating through a process of mergers and takeovers) prefer to run them on the high-volume, east-west routes with one or two calls at each end at a super hub port or Superterminal (McCalla 2004). A Superterminal has deep water, with sufficient turning room, crane reach and capacity, and landside storage for ships over 6,000 TEU. Current security concerns may also encourage such a trend if they are well managed and do not lead to port congestion (UNCTAD 2005). On the other hand, port congestion, shipper preference and a determination by port authorities to keep up with the largest ship sizes at whatever cost, may force ship owners to call at several ports on a rotation (Robinson 1998).

Investment in container terminals is continuing in Britain, as for example the Thamesport terminal in the Medway, created from the old Isle of Grain oil refinery, and proposed terminals or extensions at Felixstowe, Bathside Bay on the Stour, London Gateway on the Thames (The Planning Inspectorate 2006) and at Hull and Bristol (The Bristol Port Company 2006, Landon 2005). As ships on the main routes become very large, the large ships that they replace will move to second order networks. Even feeder ships will become larger (UNCTAD 2005).

Environmental concerns are having an effect on plans to build newer, larger container terminals just as they affected MIDA ports thirty years previously. McCalla (2004) has created a model of container terminal development that, he claims, updates the Anyport model (although he ignores other port activities at bulk, ro-ro and neo-bulk terminals). It consists of five stages. Stage 1 is the first purpose-built container terminal, usually quite small. Stage 2 involved a choice of closure (if the terminal was unsuccessful) or expansion. Stage 3 is the building of additional container terminals at a port to cope with growing traffic and the restrictions of the original site. Stage 4 is consolidation: physical or through ownership. This stage tends to run in parallel with expansion, rather than as a discrete stage. Stage 5 involves redevelopment to create a Superterminal to handle ships of 6,000TEU and over and to allow the port to remain in the front rank of hub ports. This stage is marked by an environmental awareness amongst other stakeholders in the local area, especially the local residents, which has the possibility of halting an unpopular development that has not made a good enough business case (such as ABP's proposed terminal at Southampton).

The engine behind the increase in container ship size and in port facilities is growth in world maritime trade. Container shipping is both the handmaiden and the enabler of world maritime trade, creating new markets by cutting the cost of distance and then serving those markets (Donovan and Bonney 2006). New markets increase trade; increased trade creates economies of scale, economies of scale cut costs and create new markets. Apart from all the structural reasons already given, this is why large ports are not pushing smaller ports into oblivion, but instead an unstable hierarchal system of container ports has been created, with super hubs (also known as mega hubs and load centres) at the top, feeder ports in the middle and regional ports handling a few containers at the bottom (Drewe and Janssen 1996). The overall picture is complex and involves both concentration and fragmentation (Palmer 1999) with new ports being created or moving up at every level (Robinson 1998, Zeng and Yang 2002). One of the new super hub ports, Gioia Tauro, has reported a drop in volumes in 2006 because "as soon as volumes destined for specific areas reach economically viable levels, shipping lines open up direct and/or shuttle services, so avoiding the need for transhipment" (Cecilia Battistello, reported by McLaughlan 2006 p. 18).

Drewe and Janssen (1996) make a very clear distinction between transport logistics, which involves the optimisation of logistical assets such as ships and warehouses, and product channel logistics, which concerns managing the whole logistical process from factory to consumer (and increasingly to the final deconstruction of obsolete goods). To gain the most from transport assets, the operator needs to maximise economies of scale by running very large ships between two very large hubs. Ports that have ambitions to be those hubs have to embrace the 'mainport' concept based on the growth of tonnage throughput. On the other hand, product channel logistics is about responding to customer needs (Drewe and Janssen 1996). The shipper wants to put cargo through her local port and needs reliability, flexibility and customer service. Information technology and low labour inputs mean that cargo transformations can take place anywhere along the supply chain, not just next to the port. There is a tension between the two types of needs that, together with competitive behaviour and growing trade, result in the instability of the port hierarchies.

2.5.2 Waterfront Redevelopment

It has already been observed that the advent of specialised shipping (especially container shipping) led to a retreat of commercial port functions from the old city port area. Further reasons given for the well-documented retreat include the sheer scale of land required by the modern port (Hoyle 1989), the growth in air passenger traffic leading to the loss of the liner passenger trade, decline in waterside heavy engineering works and in the case of Preston, the old enemy, the silting up of a port (Griffiths 1991). This retreat is phase IV in Hoyle's (1988) model of the evolution of the port-city interface (see figure 2.4). It leaves behind a legacy of derelict land and workless people. The next phase is that of waterfront redevelopment. This involves the use of spatial strategies to overcome not only the physical dereliction, but also the social problems created by past poverty and present unemployment within the old port area (London Docklands Development Corporation 1998). London Docklands provides an example of what can be achieved (figure 2.19). The London Docklands Development Corporation (LDDC) halted the filling-in of docks, recognising instead that the water provided an attractive amenity in itself and for water sports and wildlife. Public money was used as seed funding to pay for infrastructure, with private funding for commercial building projects on a planned ratio of 1:5 (Church 1988). This model has been widely used in Britain (including Bristol), continental Europe, North America, Australia and Japan (Hoyle 1989, Meyer 1999).

The great waterfront development projects of London, Barcelona, New York, Rotterdam and elsewhere have been accompanied by an argument over the proper place of public and private money; public and private planning. The ideology of privatisation of businesses and services previously in the public sector, forces public bodies to evaluate the success of regeneration in purely economic terms, such as land sale prices and job creation. This has led to some notable failures, such as the bankruptcy of Olympia and York at Canary Wharf, which was isolated from an integrated public transport network. Subsequently, the LDDC produced an integrated development framework intended to improve connectivity and give stronger spatial emphasis to public open areas and the waterfront (Meyer 1999).

West India Dock looking towards the City in 1982

Canary Wharf and the Isle of Dogs 1997

Figure 2-19 London dockland before and after regeneration

Source: London Docklands Development Corporation 1998 p. 3

2.6 Conclusion

This chapter has traced three strands of thought in modelling the development of a port. The physical development has been traced using Bird's 1963 Anyport model, dated from the first century AD to about 1960. Then the MIDA model was used. This concerns bulk shipping and dates from about 1948 to the 1970s in Europe and the present day in developing countries. Notteboom and Rodrigues' 2005 port regionalisation model and McCalla's 2004 Superterminal model is based on container terminal development and dates from about 1960 to the present day. By comparing these models to real ports, it can be seen that a few ports, such as London up to the middle of the twentieth century and Rotterdam from then until the early twenty first century, have been at the forefront of each new phase. Most ports, however, have developed up to a certain level and then stopped. This can be seen in the case of all the Southwest's ports except Bristol. A few have closed but most continue to provide a service to their hinterland and foreland, however small and specialised that may be. Other ports have dwindled for a time due to changes in trade, structural problems or poor management, and then made a late burst to catch up with the front rank. This is the case with Bristol, which is now planning its own Superterminal in deep water in the Bristol Channel (The Bristol Port Company 2006, Lloyd's List 2007).

Models of port hinterland, foreland and inter-port competition have been examined. Early models are all based on ports in developing countries where the combination of colonisation and powered shipping saw the rapid extinction of many small, pre-colonial ports and a state monopoly of a few, dominant ports. Later models of port competition and hinterlands relate to containerisation. The McKinsey and Company, Inc. (1967) model is based on the concept of automation and again it postulates the domination of a few, ideally located ports and the reduction of other ports to mere feeder systems. The primary hinterland has disappeared and the competitive hinterland expanded up to and beyond neighbouring ports. The model by Notteboom and Rodrigues (2005) includes an offshore hub port built to serve a continent or crossing trade routes but lacking any primary hinterland. It also shows a superseded port taking up a feeder role and then becoming a load centre. In a situation of growing international trade, this model seems to fit the empirical evidence best. In Europe especially there is an unstable hierarchy of ports. Drewe and Janssen (1996) suggested three levels of port but Stopford (1997) has modelled the hierarchy as four types (figure 2.20). A few ports close, as they have always done, due to changing physical or economic conditions, but most continue with their specialised hinterlands. New ports are created where there is the will and the demand conditions.

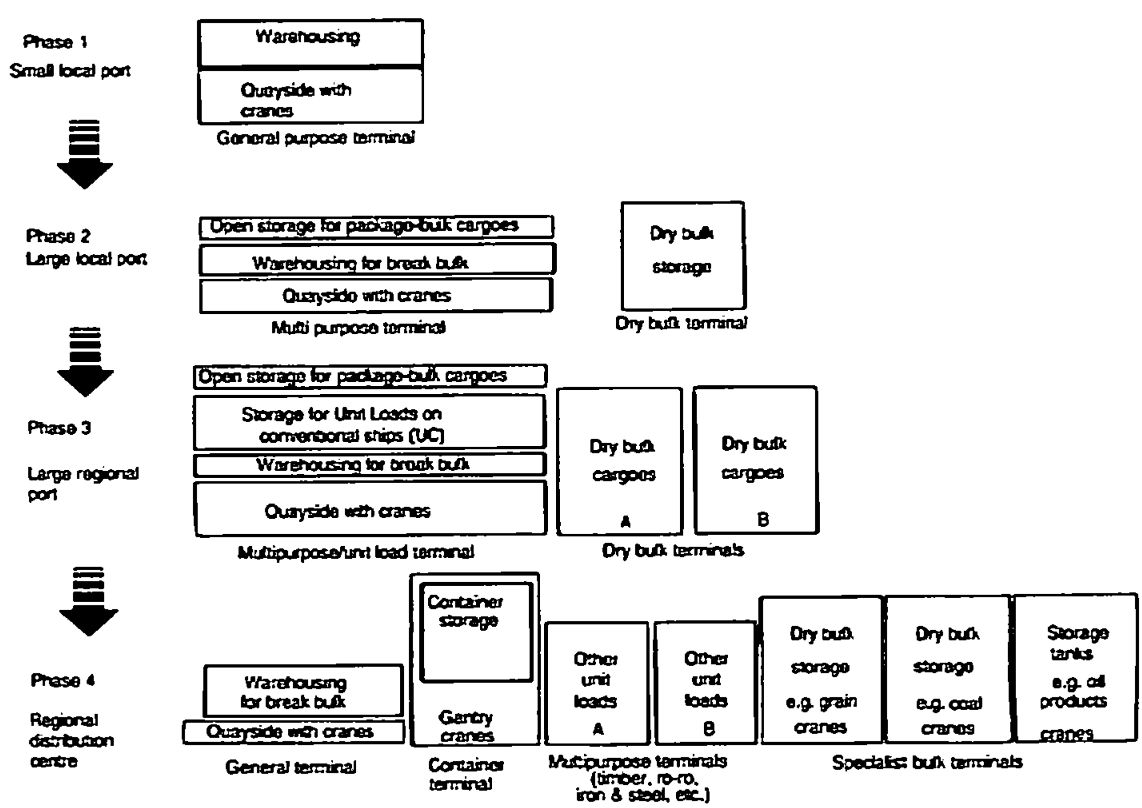


Figure 2-20 The Hierarchy of Ports

Source: Stopford 1997 p 30

Ports gain or lose their place in the front rank as conditions change. Port development is path dependent in so far as past choices shape current options, but it is not time dependent: ports can catch up if there is a the will and the economic incentive to do so.

The relationship between a port and its city (or town) has also been followed through different models. They show the port and city interlinked and inter-dependent before the Industrial Revolution. Changes to shipping technology during and after the Industrial Revolution led to a gradual process of divorce between the physical and cultural spaces of city and port, as port functions became more enclosed, moved towards the sea and shed jobs. The third phase is that of the port as logistical centre, the retreat of port functions from the old waterfront and its redevelopment for non-port uses such as housing or recreation. This phase offers the opportunity for the port and city to redefine their identities. The port can use heritage sites to sell its past to the city and economic impact studies to sell its present strengths (Suykens 1989). Pesquera and Ruiz (1996) also see opportunities for the city's service sector to re-integrate with the port. On the other hand, many observers point to the reduced spatial pull of port-related activities towards the modern waterfront, so that the modern port is part of a regional network of business rather than a purely local network (Notteboom and Rodrigue 2005). This weakens the tie with the city and affects planning and investment decisions. A city that was once proud to invest in 'their' port may now wish only to extract money from the port in recompense for the environmental damage it causes.

Chapter 3 Entering the Research Field: Ports, Policy, Short Sea Shipping, Southwest England and Regional Competitiveness

3.1 Introduction

This chapter covers the literature review that was carried out before data collection began in April 2002 and up until analysis of the data later in the year. It represents the process of entering the research field and the framing of the questions that were posed in the first interview. In the areas of ports policy and regional competitiveness there have been significant developments since 2002, so in these fields the data have been updated to 2006.

Janesick (2000) describes the process of qualitative research in three phases. The first phase, represented by this chapter (and the next), is like the process of warming up in dance. It is when the early design decisions have to be made about questions guiding the research, selection of the site and participants, and choice of an appropriate research strategy. The next phase is the start of the actual research. During this time, the early findings and experience in the field lead to changes in the research design and the participants. Categories are formed and discarded and working theories developed. In the final phase, design decisions have to be made about the narrative and presentation of the data.

To understand the policy background against which Southwest ports have developed, the next section of this chapter contains a review of post-war British ports policy up until the year 2002, which was used to frame the opening stage of the research. This is followed by a section containing some important developments to 2006, which informs the conclusions of the research. There follows a brief review of European Union ports policy because transport policy in general comes under the remit of the European Union, and this is again updated to 2006.

Then there is a review of short sea shipping, which is the sector that uses small ports and wharfs. Its strengths and weaknesses are explored and the European Union policy environment discussed.

New Labour ports policy was expressed in the government's paper "Modern Ports: A UK Policy" (DETR 2000a). This highlights the use of port policy to promote UK and regional competitiveness. Regional competitiveness concerns the relative economic health of a region, and particularly the socio-economic issues of unemployment, education and labour mobility (Charles and Benneworth 1996). The concept of regional competitiveness is the starting point for an enquiry into commercial ports in the Southwest of England. Port capacity is highlighted as a key aspect of regional competitiveness because of the port's function as a gateway to trade. This is followed by an exploration of the understanding of the term 'regional competitiveness' and its application to ports.

3.2 British Ports Policy

3.2.1 British Ports Policy 1945-2002

British ports policy since 1945 has passed through a number of distinct phases. In the first phase, from 1945 to 1964, the key elements were nationalisation and repair or replacement of damaged and obsolete superstructures. In 1947, about 30% of British ports were nationalised and transferred to the control of the British

Transport Commission (BTC) Docks and Waterways Executive, but otherwise ownership took a variety of forms. Within the sector, there were fragmented services, poor management, no strategic direction and relatively light regulation. The 1947 Dock Workers (Regulation of Employment) Act set up the National Dock Labour Board (NDLB), which dealt with the registration, recruitment and discipline of dockers. It did, however, leave the many small, private employers free to hire and lay-off workers on a day-to-day basis and pay them piecework rates, to meet the variable demand inherent to dock labour (Rayner 1999, McNamara and Tarver 1999).

Many ports were owned and run by a Trust for port users. Others such as Bristol and Watchet were owned by the municipal or local authority. Some were privately owned, such as Felixstowe, or under mixed ownership, such as Teignmouth with a private dock and trust harbour and Manchester, which was a private company most of whose shares belonged to the City Council. In 1962 ownership was further fragmented when the BTC was broken up. The British Railways Board took over railway ferry ports such as Folkestone, the British Waterways Board controlled some small river ports and the British Transport Docks Board controlled the rest (Turnbull and Weston, 1993, Thomas 1994, Saundry and Turnbull 1997, Goss 1998).

In 1961 a Committee of Inquiry into the Major Ports of Great Britain (the Rochdale Committee) was set up to examine the current state of the ports and make recommendations on future policy. One of the biggest obstacles to the work of the Committee was the lack of comparative statistics for ports, or indeed any statistics on port efficiency. This was a cry repeated more recently by the European Union concerning EU ports (see Council Directive 95/64/CE of 8th December 1995). The

Rochdale Report endorsed the 'Anglo-Saxon' doctrine that ports are not public infrastructure like roads and bridges, but rather they are businesses to which normal financial principles of accounting, investment and profit making should apply. Excess capacity in the ports sector, then and later, was perceived as one root of poor financial performance, with fragmentation and poor management as the other. It was recommended that a National Ports Council (NPC) be set up to advise the government, which took powers over port investment decisions (Thomas 1994).

The 1964 Harbours Act implemented the recommendations of the Rochdale report and ushered in the next phase of port policy, that of central planning. This phase lasted until the abolition of the NPC under the Thatcher government in 1981. Where the NPC was allowed to carry out its work unhindered it enjoyed a modest success; gathering some statistics; consolidating port authorities within a single estuary on the Clyde, Forth, Humber, Medway, Tees and Tyne; and giving advice and incentives for better investment proposals. Unfortunately, this was also a time of deepening decline in the major British ports due to changes in trade, poor planning, political interference in investment decisions, poor management and rigidities in the labour force (Goss 1998).

In 1965 another committee of inquiry into the ports industry (HMSO 1965) produced the Devlin Report. This recommended a basic salary for dockworkers and an end to casualisation, which was seen as a major reason for the failure of UK docks to modernise (Rayner 1999). Perceived problems of fragmentation of stevedoring companies were addressed through the Docks and Harbours Act 1966, which established a licensing system designed to reduce the number of stevedoring companies (HM Revenue and Customs 2006). The casualisation of dock labour was reformed through the establishment of the Dock Labour Scheme 1967 that, with the Aldington-Jones Agreements of 1972 and 1974, made it impossible to sack surplus dock labour. If an employer went out of business, the registered dockers had to be taken on by other employers in the same port, with the port authority as employer of last resort. All of this took place against a background of mechanisation in cargo handling that led to huge reductions in the labour needed at ports (Turnbull and Weston 1993). This combined with restrictive labour practices, a strong union and weak management to make British ports both costly and inefficient. The dockworkers' union was very powerful and a dock strike in 1970 led to a state of emergency being called (BBC 2006).

The most notorious example of political interference in investment decisions was the case of the Portbury schemes, proposed by the municipal port of Bristol to overcome the limitations of a shallow river site. A large investment scheme was first proposed in 1965. It was supported by the NPC but the Ministry of Transport, using a 'gravity' model to predict traffic flows, claimed that Bristol lacked a natural hinterland and would have to attract cargoes from other ports. This led to a political decision to block the development because of the risk of damaging neighbouring South Wales ports (Wilson 1983). A reduced scheme was allowed through ten years later, too late to ride on the early container boom and just in time for the shift in traffic to East Coast ports engendered by Britain's entry to the EEC (now the EU). The development lost money for many years after it was built. In many other instances, political pressure led to the granting of permission for large investment schemes that could not be justified in terms of demand for increased capacity (Wilson 1983). This, with a reluctance to close obsolete docks (because the dockworkers could not be made redundant), led to a continuation of the overcapacity that the NPC was meant to prevent.

When the Thatcher government came into power in 1979, ports were still failing to meet their financial targets, grossly overmanned and with too much capacity for the demand (Thomas 1994). Where once British ports had acted as transhipment points for imports to the Continent, that trade had been totally lost and British imports now travelled via efficient Continental ports. For example, 42% of imports from and 3% of exports to the USA went via Dutch and Belgian ports in 1984 (Asteris 1990). Trade had become distorted away from Dock Labour Scheme ports to the former minor ports outside its oppressive embrace. Felixstowe, a non-scheme port, was the major container port in the UK, leaving the London docks in severe economic decline. Small ports and wharves flourished everywhere as transhipped cargoes came to them (Garret 1995). Planning had palpably failed, not least because the NPC never produced the full national ports plan required by the 1964 Harbours Act. In 1981 the Thatcher government abolished the NPC.

The next phase of port policy, from 1981 to 1997, was one of deregulation and privatisation. In 1982 the former British Transport Docks Board ports were reconstituted as Associated British Ports, a public limited company that was later sold. The former British Rail Board subsidiary for ports and ferries, Sealink, was sold to Sea Containers in 1984 (Saundry and Turnbull 1997). In 1989 the National Dock Labour Scheme was abolished, leading to a massive shedding of dock labour. The Ports Act of 1991 gave trust ports the right to privatise and five chose to do so in 1992 and a sixth in 1996. Ipswich was forcibly privatised in 1996 under government powers in the 1991 Act. Dover and the port of Tyne were saved by the change of government in 1997 (Baird 1995, Saundry and Turnbull 1997).

From 1997 onwards, there has been an official laissez-faire policy towards ports. Government policy was expressed in the 1998 White Paper, "A New Deal for

Transport: Better for Everyone" (DTI 1998). The themes in this document were integration between modes, (environmental) sustainability and a return to regional planning of transport. In practice, environmentalism is proving to be the key theme of this phase. The 1998 White paper gave broad policy aims for ports that supported competition and multimodal transport and emphasised the environmental aspect of port developments. The forced privatisation of trust ports would not go ahead, and the role and status of trust ports would be reviewed. The results of that review were published in 2000 (DETR 2000b). The concept of trust ports was endorsed and a benchmark guide to standards of accountability was set. All trust ports were required to submit plans for achieving the benchmark standard within six months, and to reach them within two years.

The major statement of port policy under the New Labour government came in the paper "Modern ports: A UK policy" (DETR 2000a). This stated, "It is not Governments [*sic*] job to run the ports industry" (DETR 2000a p. 3). The key points of government policy were:

- *UK and regional competitiveness*
- *High nationally agreed safety standards*
- *The best environmental practice*

(DETR 2000a p. 4)

The ports industry responded to the policy document with very little enthusiasm. They were concerned by its lack of awareness of the wider EU context and especially the elements of unfair competition from Europe. They were disappointed by the lack of strategic planning to address port capacity problems: a looming shortage of capacity, for once, not over capacity. They also felt that the burden of compliance with environmental legislation was already too onerous and threatened to become worse (DTLR 2002).

3.2.2 Ports Policy in England and Wales 2003-2006

The Department for Transport published a Project Appraisal Framework in 2003 after a period of consultation (Department for Transport 2003). It was intended to provide advice and guidance for those planning a port development.

The House of Commons Transport Committee published a "Report on Ports" in 2003 (House of Commons Transport Committee 2003). The government responded to it in 2004 (Department for Transport 2004a), although the response only concerned ports policy in England and Wales. Ports in Scotland and Northern Ireland are part of the devolved responsibility. Both the report and the response covered four main areas: port statistics; health, safety and training of dockworkers; port development and competition with European ports.

The House of Commons wanted the Standard Industrial Classification of Economic Activity system (SIC) to be modified to make data collection on the port industry more refined. SIC (2003) is a national system for classifying all types of economic activity. It is a four or five number code. At the two-digit level, it is aligned with the United Nations' International Standard Industrial Classification (ISIC) system, and at the four-digit level, it is precisely aligned with the EUROSTAT system of Nomenclature Generale des Activites Economiques dans les Communautes Europeennes (NACE) revision 1.1. Within the EU, governments are allowed to introduce a fifth level of categorisation that need not be aligned with other systems. For example, the category 63.12 (storage and warehousing for all types of goods), has been subdivided to differentiate between storage of frozen or refrigerated goods, liquids or gasses, grain and all other types of storage. Ports come under code 63.22 (other supporting water activities), but there is no way of differentiating the operation of terminal facilities from navigation, pilotage and berthing activities. The next revision to the UKSIC is due for 2007 and it would be a simple matter, requiring no international alignment, for a fifth level to be added to code 63.22. However, the government policy is to identify seaports separately as a main transport activity (presumably at the two-digit level as 68 or 69) and then breakdown the different activities of sea ports at the three and four digit level. This is an ambitious scheme requiring, first EU agreement, and then international agreement. It cannot be completed in time for the 2007 revision (Office for National Statistics 2002, Department for Transport 2004a).

Other than the SIC question, the House of Commons called for better statistics in general on port employment, health and safety, infrastructure (presumably port capacity, although the government interpreted it as referring to port efficiency), and general economic impact (House of Commons Transport Committee 2003). Moreby, in commenting on the report (Moreby 2004), was critical of the "layers of legislation, regulation and EU directives" (Moreby 2004 p. 249) and claimed that port operators must be "driven to despair" (Moreby 2004 p. 249) by this call, especially as there was no evidence that better statistics would lead to greater efficiency. The government replied more moderately. It was working to improve statistics on employment and health and safety. It wanted performance indicators for ports but the industry was not co-operating, and no more economic data was needed except for the employment data (Department for Transport 2004a). It should be noted that, although cargo throughput is disaggregated by cargo type for the 52 major ports of the United Kingdom (those handling at least 1 million tons of cargo in 2000 in the Department of Transport statistics, for the minor ports it is not (Department for Transport 2006b). This makes analysis of the sector difficult. There does not even appear to be a central list of active minor ports, as a recent government sponsored forecast of bulk port capacity used customs ports as a proxy for all ports and so included the ports of Watchet and Exeter, both long defunct, while failing to include such ports as Bideford and Bridgwater (MDS Transmodal 2006).

As far as the health, safety and training of dockworkers were concerned, the UK government seemed unwilling to make any kind of special case for ports, from training to port inspectors. They refused the House of Commons Transport Committee's recommendation to ratify the International Labour Organisation Convention 152, which covers safety in lifting operations, claiming that it was too prescriptive (Department for Transport 2004a).

Port development was a major area of concern for the House of Commons Transport Committee. This included environmental monitoring, the provision of rail and road connections to port developments, forecasting demand, raising the threshold for calling an inquiry into a Harbour Revision Order and laying down a national strategy for ports (as for airports) rather than considering them on a piecemeal basis. The government claimed that is was too late to formulate a strategy in time for the current development submissions, which would (if implemented), create enough capacity for many years to come (although only for container ports). Airports were a special case: ports were not. As far as road and rail connections went, they very much wanted to have their cake and eat it. Yes, ports were important, yes, road and rail were public sector responsibilities, but ports must pay for upgrading connections to new developments or take their turn in the queue where other areas have a higher priority. Rail freight budgets were not going to be ring-fenced (Department for Transport 2004a). This policy was criticised as "short sighted and naïve" by Leggate, who also points out that Continental European ports are upgrading the rail infrastructure to improve their competitiveness, at central government cost (Leggate 2004 p.178).

Both the UK government and port operators share a confused attitude to European port competition. The port operators demand commercial freedom, and the government demands freedom from paying for ports, but both sides then accuse Europe of unfair competition because the state is willing and able to pay for ports (and their inland connections) as essential infrastructure. Apart from worry about the Port Services Directive (apparently dead at the time of the government response), specific issues mentioned by the select committee were transparency in state aid, the fact that the UK had applied the Habitats Directive to port approaches whereas the continental ports were *all* unhampered by it, and the issue of light dues. The government made affirmative noises over state aid. The effect of the Habitats Directive on capital dredging schemes is explained in chapter five. The government claimed that it was doing precisely as it was told to do by the Directive, implying that it was Continental administrations that were not following the rules. As for Light Dues, the government claimed that other countries did follow a policy of charging ships in port for the consumption of navigation aids, but that it would review the policy (Department for Transport 2004a). It should be noted that the major competitors to UK ports do not pay Light Dues.

A Department for Transport white paper was issued in 2004 (Department for Transport 2004b) but it was mainly concerned with passenger transportation. It did promise to review the policy framework for ports by late 2005. Environmental issues continued to be given great weight, with "a strong presumption against schemes that would significantly affect environmentally sensitive sites or important species habitats or landscapes" (Department for Transport 2004b p.16). By the very nature of a port, that must apply to all port development schemes. The Dibden Bay (Southampton) port development proposal put forward by ABP was turned down by the government in April 2004 entirely on environmental grounds (Department for Transport 2004c). However, in July 2005 the government offered a qualified agreement to the proposed Shellhaven development, on the site of an old oil refinery at Thurrock in Essex. This development is for a container port and associated logistics centre. The reservations concerned road access, not rail connections (Department for Transport 2005). A number of other substantial port developments were approved between 2004 and 2006, including developments at Immingham, Hull (against the inspector's recommendation), Felixstowe and Harwich (Department for Transport 2006a).

In May 2006, the government published a consultation paper on the review of ports policy in England, Wales and Northern Ireland (Department for Transport 2006c). It also published forecasts of port demand to 2030, commissioned from the consultants MDS Transmodal (2006). The key issues were summarised as: meeting the future demand for port capacity (high or low) in an environmentally sustainable way; regional development objectives and ports (apart from Hull, all the approved port developments are in the South and East of the UK); and a welcome spotlight on the needs and potential of smaller ports. These are all examined within the context of the current, very complex, policy and regulatory framework. An additional layer of complexity is the concurrent consultation on a proposed Marine Bill (DEFRA 2006a). The proposed Marine Bill will create a planning framework for the coastal waters of England, Wales and Northern

Ireland. Where areas of concern overlapped between the two consultations, such as marine consents and marine habitat conservation, it was agreed that the Marine Bill consultation would deal with submissions (Department for Transport 2006c).

3.3 European Union Ports Policy

3.3.1 EU Ports Policy 1957-2001

The founding treaty of the European Union (EU), the Treaty of Rome 1957, established a Common Transport Policy (CTP) to aid the free movement of goods and people. Articles 74-85 outlined the broad policy areas where the Treaty applied to transport, specifying the modes of road, rail and inland waterways. This required majority voting by Member States. The Treaty could be applied to air and sea modes but only with unanimous voting. Ports were not mentioned.

In the early years of the European Union (EEC, as it then was), sea transport was deemed by many to be outside the Common Transport Policy, on the basis of Article 84, paragraph 2 of the Treaty of Rome, which said that the Council of Ministers may, by acting unanimously, decide on provisions for sea and air transport. This was interpreted to mean that until such a decision was made, the Treaty of Rome did not apply to sea and air transport. The EEC Commission took an alternative interpretation that the Treaty of Rome applied broadly to sea and air transport but the provisions of articles 74-83 did not so apply. A report by Kapteyn in 1962 suggested a framework for a ports policy but, with the exception of setting up a Port Working Group, ports were side-stepped (Bird 1967, Bird and Pollock 1978, Tovar *et al* 2004). The accession of Denmark, Ireland and the UK in 1973 to the EEC (all of them maritime states), led to a keener interest in matters maritime.

In 1974 a ruling of the European Court of Justice (ECJ) led to the inclusion of sea transport in the CTP (Chlomoudis and Pallis 2002).

Measures were taken in 1986 to apply the basic principles of EEC law to maritime transport. Four European Council Regulations (numbers 4055-58/86 of 22 December 1986) applied the principles of freedom to provide services, dealt with the application of the Treaty of Rome to maritime transport, covered unfair pricing and free access to ocean trade. These Regulations were applied to individual ports in a series of ECJ rulings. In 1991 the ECJ declared it illegal for exclusive rights to be given for a national company to organise port labour, employing only national dock workers. In 1994 the ECJ ruled that different pilotage dues for cabotage (sea-borne trade in national waters only) and international shipping was illegal (Hinz 1996). Cases of abuse of a dominant position were brought in the late 1990s when monopoly ferry ports were forced to give access to other ferry companies. In the port of Genoa, the ECJ ruled that exclusive rights to pilotage and stevedoring services had led to abuse of monopoly (Suykens 1998).

The Maastricht Treaty of 1992 set up the Trans-European Transport Networks (TEN-T or TENS), although ports were not specifically included into TEN-T until 2000. There was concern that spending on ports selected for the TEN-T would distort competition and lead to over-capacity. The policies for ports at this time were:

- Fair competition
- Transparency of state aid
- Safety
- Technological and equipment improvements at ports

- The economic development of poorer and remote regions, with transport and regional development complementing each other
- Rebalancing of transport away from the excessive growth of road transport towards more use of water and rail transport
- Financing of port infrastructure projects from various funds, to be based on both financial and social cost-benefit analysis

(Hinz 1996, Pallis 1997, Chlomoudis and Pallis 2002)

Two safety-related issues received attention from the EU in the 1990s. The first was the 1993 Hazmat Directive, a Directive on the reporting by ships of dangerous goods, and the second an EU regulation enforcing an International Maritime Organisation (IMO) Resolution to reduce port prices for tankers with segregated ballast tanks. Research and Development projects were set up with a particular emphasis on port information technology and port equipment. Work began on the creation of a Maritime Information System (MARIS) (Pallis 1997, Suykens 1998).

EU policy on ports was spelled out in the 1997 Green Paper on Sea Ports and Maritime Infrastructure. This suggested, among other things, an EU Framework for port charging. Charges were to be linked to costs based on the marginal social cost of infrastructure, providing fair competition between ports. It also stated that the port services market should be liberalised. The European Seaports Association, ESPO, was appalled by the idea of a Framework because it had been working with the EU on much less prescriptive Guidelines (ESPO 1997, European Union Commission 1997).

The Lisbon Special European Council of 23-24 March 2000 (the Lisbon Agenda) was intended to invigorate EU policies with an action plan to improve low productivity and growth in the EU area. It called for greater efforts to achieve liberalisation in transport and other areas. This led to the 2001 'Ports Package', Quality Service in Sea Ports, of which an important element was a draft Directive, the Proposal on Market Access to Port Services. This would require transparency and free competition for the authorisation and selection of service providers. All non-conservancy services would be included from pilotage to stevedoring. Each port would have at least two stevedoring firms or agencies and self-handling (cargo handling by ship's crews) was to be permitted (European Union Commission 2001b).

3.3.2 EU Ports Policy 2002-2006

At the end of 2002, the draft directive on Market Access to Port Services was moving through the process of approval by the European Union institutions, in the face of a great deal of opposition. The dockworkers of Europe objected to proposals on self-handling. The port owners objected to the bureaucratic and divisive nature of the directive, and maritime pilots were furious at the attempts to introduce competition into their sector. The directive was defeated on its third and final hearing in the European Parliament after various compromises failed to gain agreement. Six months later, the outgoing transport commissioner, Loyola de Palacio, re-introduced the directive (Stares 2004). This move provoked fury and direct action from dockers and dismay from port operators who claimed that it was complicated and badly drafted. In January 2006 the voting in the European Parliament's Transport Committee was confused. It was rejected in other committees and finally thrown out for the second time by the full Parliament (Stares 2006).

The latest initiative from the European Union Commission is a Green Paper on a Future Maritime Policy for the European Union (European Union Commission 2006). The consultation process was set to last from June 2006 to June 2007. The Commission was asking for views on the principle of an overarching maritime policy, drawing together different policy areas, as well as views on the contents of the green paper. Ports are mentioned in the paper in connection with growth, competitiveness, sustainability, safe shipping, security, pollution, port capacity and planning, competition for space (land) in and around ports, port concentration and port and shipbuilding clusters. Short sea shipping and the Motorways of the Seas concept are also highlighted for further promotion.

3.4 European Union Policy on Short Sea Shipping

In many ways the promotion of short sea shipping is the driving force behind EU thinking on ports and ports policy. The EU recognises the environmental benefits of water transport but it also sees maritime trade in particular as a cohesive force, linking the prosperous and populous heartlands with islands, peninsulas and other geographically peripheral areas. A 1992 Green Paper on the impact of transport on the environment (European Union Commission 1992) identified short sea shipping as a priority area for encouraging the shift of freight away from roads (Pallis 2002). In 1995 a Commission communication (European Union Commission 1995) advocated short sea shipping but said that member governments needed to take action to improve quality and efficiency. In 1996, the Council adopted a resolution urging member states to take any action needed to promote the growth of short sea shipping (European Union Commission 1996) and in 1997 after the Commission presented a progress report (European Union Commission 1997), biennial progress reports were called for to assess the results of promotion measures. The second biennial progress report was presented in 1999 (European Union Commission 1999). This looked at the documents and administrative procedures that slow down productivity in the maritime sector, the old-fashioned image of short sea shipping and the actions that can be taken by ports.

One concrete gain from all this policy interest was the availability of money for research and development spending on short sea shipping (Pallis 2002). For example, the Directorate General for Transport (DGVIII) of the European Commission initiated a Corridor Study in 1992-1993 that analysed the competitiveness of short sea shipping in various shipping corridors. This found that the competitive position of short sea traffic was generally weak, especially for unit loads (Wijnolst *et al* 1994). It should be noted that most European Union policy has focused on the high-growth area of container transportation, followed by other unit loads, with little attention paid to the unglamorous dry bulk section.

In 2001 the European Commission published a transport White Paper, "European Transport Policy for 2010: time to decide" (European Union Commission 2001a). This wide-ranging document included a section on short sea shipping and inland waterways. It made explicit once more the environmental and cohesive benefits of maritime transport and claimed that the current volumes of waterborne goods traffic, despite growing at close to the rate of growth in road transport (27% growth as compared to 35% growth for road between 1990 and 1998), was below capacity. Four specific areas for recommendations were covered:

- A 'motorways of the sea' policy as part of a multimodal transport network. Some ports would be included in the Trans-European Transport

Networks (TEN-T) and efforts were to be made to streamline the time in port with, for example, EDI reporting and electronic customs clearance.

- A new Marco Polo programme to support intermodality (carrying goods on more than one transport mode during a single journey) by improving the operation of the entire intermodal chain. This would see freight shifting from roads to rail or water. Money would be available for start-up and pilot projects in short sea shipping.
- The regulated emergence of freight integrators and the adoption of standardised containers, and swap bodies that could load two pallets side-by-side and move readily between modes.
- A common, EU-wide recognition of boatmasters' certificates and regulation of crew working conditions to facilitate international use of inland waterways.

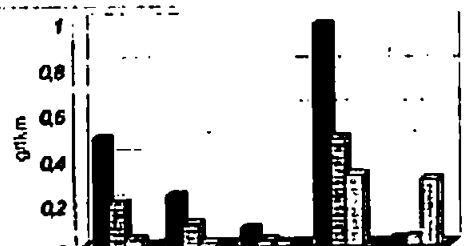
These are practical and achievable recommendations, based on past research and consultation with the industry, especially within the short sea panel of the Maritime Industries Forum. They recognise that a revolution in modal choice for European trade will not happen within the present cost environment but, within the competence of the European Union, they will facilitate unit loads in short sea shipping and may help the dry bulk sector.

3.5 Short Sea Shipping

The small ports of Southwest England are used by short sea shipping. That is, generally smaller ships that do not cross oceans and which spend a significant proportion of their time in port. These ships tend to trade within a restricted geographic area (this used to be known as coastal trading or near Continental trading). European short sea shipping covers the Mediterranean, the Atlantic Arc of Spain, France, Western Britain and Ireland, the English Channel, the North Sea, the Baltic Sea and the White Sea. Ship sizes again used to be very small, just a few hundred tons deadweight and often less than 500 gross tons (to avoid much merchant shipping regulation and reduce port dues). Today the rules have changed and economies of scale have come into effect. Stuchey and Zachcial recorded in 1991 that the average size of modern short sea ships had more than doubled to over 3,000dwt and some ships were up to 10,000dwt.

Cargoes carried by short sea shipping fall into three broad categories. The first are roll on-roll off (ro-ro) cargoes consisting of lorries and trailers with or without tractor units. These include the ferry services within the Mediterranean, the Baltic Sea, on the North Sea, between Ireland and Britain, and between England and France or Spain. The second cargo type is carried on liner services that follow a regular route although not necessarily to a published timetable. The cargoes are normally packaged in some way. Timber from Scandinavia to England was one such trade, but the modern trend is towards containerised cargoes, including feeder traffic to and from the major ports. Finally there are tramp cargoes, either in small units of bags, pallets, crates, cars, rolls and coils (usually carried on modern tonnage) or traditional wet and dry bulks such as petroleum products and chemicals (now carried on highly sophisticated and technologically advanced ships), other bulk liquids (e.g. molasses, lard) and bulk solids such as stone, coal, scrap, grains, china clay, road salt and cement. The latter tend to be carried on older, smaller tonnage running on a minimum cost basis.

Within Europe, short sea and inland waterway shipping has long been recognised as an important route for international trade. Between 1970 and 1997, trade on inland waterways remained static but intra-Europe short sea shipping grew by 200% in terms of ton kilometres, although it was overtaken by road traffic in 1990 (Chlomoudis and Pallis 2002). In 1995 the European Commission advocated short sea shipping as a less polluting transport mode than road (European Union Commission 1995) and in 1999 a table (figure 3.1) was published comparing the fuel consumption and emissions of the various transport modes of road, rail, air and sea. Road transport had the highest fuel consumption and level of emissions and maritime transport was the lowest by far in all respects except for sulphur dioxide (SO_2) (European Union Commission 1999).



	CO	HC	Particulate	NOx	SO2
Road	0,479	0,227	0,078	0,978	0,031
Rail	0,196	0,096	0,027	0,472	0,038
SSS	0,036	0,012	0,008	0,311	0,29

Figure 3-1 estimated average CO_2, hydrocarbon, particulate, NO_X and SO_2 emissions from road transport, rail transport and short sea shipping in grams per tonne kilometre.

Source: European Union Commission (1999) p 22.

Sea transport is now considered clean and green (European Union Commission 2005). It has a good safety record and it does not require permanent ways so there is little land-take. Investment needs are relatively low as infrastructure between terminals consists only of navigation aids, with ports at the terminus (Stuchey and Zachcial 1991). On long distance routes, it is regarded as a serious alternative to road traffic with all the implications for reducing road congestion.

3.5.1 Problems with Short Sea Shipping

According to Stuchey and Zachcial (1991), traffic is fixed within its mode by type of goods, consignment size and route. There is low price elasticity of demand and punctuality of delivery is more important than speed. The problem with coastal shipping, however, is that it depends on the weather and tides. On the roads there is an occasional warning about winds and high-sided vehicles, but small ships in the northern European winter must frequently shelter against gales. They will not sail if the forecast is bad. If caught at sea they will make for the nearest shelter and may have to anchor for days (experienced coastal skippers choose their anchorage for good holding ground and good television reception). Even if they are large enough to ride before the seas they must reduce speed to prevent damage, and into the teeth of a gale their engines will make little or no headway. As ships get bigger they can cope with stronger winds but their schedules are still at the mercy of the weather. Tides also affect schedules, with strong tidal currents around northern Europe that can add or subtract several knots to speed over the ground. Most of the smaller ports have tidal restrictions, mainly over the twice daily cycle of high and low water but also sometimes over the lunar cycle of neaps and spring tides. These are generally caused by a bar at the entrance where the water is shallow and higher tides are needed to cross when loaded, but there may also be restrictions due to the speed and direction of a tidal flow near a berth or critical turning point. Some river ports (for example on the Seine) are also affected by tidal bores that send a dangerous wave down at certain times (United Kingdom Hydrographic Office 2001). There is the risk of fog at sea and especially in coastal waters. Although modern radar and radar reflectors throw an electronic seeing eye into the murk, the prudent mariner must still slow down and take the greatest care not to run down another vessel or go aground, whatever that does to schedules (COLREGS 1972). These primeval forces of nature are simply incompatible with modern logistics concepts of just-in-time and no buffer stocks. In the Plymouth area, where petroleum products are delivered by sea tanker from the refineries in Wales and Southampton, it sometimes happens that prolonged bad weather at sea results in petrol forecourts posting 'no diesel' signs. Ships also have the occasional knock whilst berthing, rope round the propeller or other mechanical failure that necessitates their being taken out of service unexpectedly. Because they are large units (and getting larger) with several skilled and certificated crew members on board who must stay with the ship during the repairs, they are not easy to replace on a regular round voyage, unlike a lorry with a single, transferable driver.

In addition to poor punctuality, productivity on coastal shipping is low. A ship only earns money whilst she is at sea. In port her costs increase with every idle hour. Ocean shipping has benefited immensely from port productivity gains since the early sixties. These came from:

- the widespread use of standard containers and other cargo units
- deregulation at ports
- competitive management because of privatisation or incorporation
- better information flows from innovations such as EDI, internet-based systems and computer cargo planning,
- technological innovations in cargo handling such as automated container parks
- improvements in process management at ports

They have all helped to slash time in port from days or weeks into hours, with long days at sea in between. However, short sea shipping by its nature spends more time in port as it only makes short sea voyages (usually no more than hours) in between each port visit. Port costs are 60% or more of the cost of short sea shipping (Strandenes and Marlow 2000). For each visit there is time waiting for a berth, time spent with agents and customs, time to open or close hatches, set pipelines and clean holds and tanks between cargoes. More time is spent on sampling, bills of lading and noting protest or agreeing the statement of facts (all documentation on paper and needing the Master's signature). If a pilot is needed he or she will only be ordered after cargo is completed with a minimum two-hour wait thereafter. Even in sectors that have invested heavily in technology and that always work over twenty-four hour shifts, such as the petroleum trades, productivity is quite low. In the traditional bulk trades where low turnover at ports and cutthroat pricing of freights has meant no investment in IT or cargo handling equipment, productivity is abysmal.

Giannopoulos and Papageorgiou, (1999) reporting on the Small/medium sized Ports with Harmonised, Effective RE-engineered processes (SPHERE) project (which was an investigation of port system requirements funded by the European Union), found a number of problems with the small and medium sized ports typically used by short sea shipping. These included bottlenecks at the terminal gate, poor links with land transport, poor organisational management and a lack of flexibility, and poor communication between the port and port user. In the publicly owned ports that predominate on the Continent, they found bureaucratic and outdated management, ineffective pricing, limited working hours and a lack of market orientation.

Waterborne transport, like rail, suffers from a lack of 'door-to-door' delivery capability. Except for a handful of facilities built at the track or waterside, freight must be loaded onto a lorry at the factory, transferred to the ship or rail wagon at the port or station, re-loaded onto a lorry at the other end and then delivered to the receiver. This is not efficient and increases costs.

3.5.2 Moving Freight from Roads to Ships

Packer (1995) reported on a "Roads to Water" research project undertaken on behalf of the British Government with the specific aim of increasing the share of U.K. traffic moved by sea rather than by road, including intra-UK, and exports and imports between the UK and the rest of Europe. He saw very limited prospects for this. His key findings were that current short sea shipping traffic must be protected as it was in decline, and that there could be no large shifts of road traffic to water with the prevailing cost structures. Some traffic could change modes but only over distances greater than 400 miles. Port interface costs should also be reduced.

Fenyoe (1995) in his response to Packer, tended to agree with Packer's results for the UK and emphasised the importance of preventing further loss of water traffic in the domestic distribution of petroleum products. He went on to discuss the importance of concerted government action to promote water and rail transport because these were both environmentally better than road. The current trend was for rail and water to be promoted separately, with the result that they would compete against each other as, for example, seemed the likely result of a new 44 tonne concession for road traffic to railheads, which would encourage the use of the Channel Tunnel to the detriment of short sea shipping trades. This point was also made by Packer and by John (1995).

In 1998 Rowlinson was more optimistic than Packer over the prospects of modal shift. He also suggested that short distance traffic flows could switch modes where there were large bulk flows, speed was not important and especially where environmental factors were added to the cost equation. Five specific traffic flows were examined where small changes to the cost structure would make it viable to shift the traffic to (or back to) water. For example, a change in the way that petroleum products were taxed had made it expensive to hold stocks in tanks at local distribution centres (which could act as a buffer stock when the ship could not come in) and therefore the switch had been made to more reliable lorry supplies. A small change to taxation would allow a return to water shipments: the loss to the Treasury would be offset by environmental gains and reduced road congestion.

3.6 Commercial Ports in the Southwest of England

Until the beginning of the twentieth century, the short-sea trades flourished in the Southwest peninsula of England. The many creeks and inlets of the long coastline allowed ready access for small sailing ships, while making road transport long and difficult (Tor Mark Press 1994). The First World War saw the end of this trade, because owners could not afford to replace the huge losses they suffered from enemy action, especially as sail had now given way to motor vessels. First rail and then road transport replaced much of the trade, while more was lost through the decline of local industries such as mining and fishing. In Cornwall alone the Tor Mark Press (1994) lists 30 lost ports. One of these, Porthoustock, has since re-opened, but today there are no commercial ports on the north coast of Cornwall and only five on the south coast (if the two quarry wharves of Porthoustock and Dean Quarry are included within the port area of Falmouth). The principal port is Falmouth, which although blessed with a superb deep-water harbour is too far from major industries to develop fully, especially as road links are inadequate, with heavy congestion during the peak tourist season. In 1970, a major container terminal was proposed but the proposal failed due to environmental considerations. In 1992 a ro-ro ferry terminal was proposed. An unpublished impact study by Roger Tye and Partners (1992) was enthusiastic about the opportunities presented by the project, but this too failed through a lack of funding. The latest plans are for a cruise terminal, with dredging to deepen the approach channels for large cruise ships (Lloyd's List 2003a).

In Devon there is Appledore, mainly a fishing port, and Bideford on the north coast, with proposals to re-open Yelland Jetty close by. Only Teignmouth and the docks and wharves of Plymouth are still commercially active on the south coast. Exmouth has closed, while Dartmouth and Torbay now concentrate on pleasure boats and cruise liners, with some trawlers. Totnes is closed to commercial traffic, although there is a timber quay that could be used for importing timber. In 1986 there was a proposal for Dartmouth to build a three berth deep water quay with warehousing, to act as a container feeder port. An unpublished economic assessment by Devon County Council Property Department (Smy and Hawkins 1986) cast doubts on the economic viability of the scheme, which would have required considerable road improvements to be viable. At that time both Plymouth and Falmouth were also talking about building container ports. In the absence of any central planning or co-ordination all three schemes were eventually dropped.

Plymouth consists of the Dockyard on the river Tamar, Milbay docks (owned by ABP), which concentrates on ferries and cruise liners, and the three wharves on the river Plym and Cattewater: Victoria Wharf, Cattedown Wharves, Corporation Wharf and Pomphlett Jetty. These are all three in private ownership and there has been considerable development of warehouse capacity in recent years. Like

Falmouth, Plymouth is a harbour with huge potential that has never quite been realised. The problem for Plymouth has been the stranglehold exerted on all development by the Naval port and Dockyard. Nothing was allowed to interfere with either manpower needs or the free movement of warships (Cau 1996). In recent years, however, it has been recognised that regeneration of the waterfront is needed, and a number of studies have been commissioned to develop a strategy for this. LDR International (1989) produced the "Plymouth Waterfront Strategy" document, which recommended developing new warehousing and wharves between Cattedown Wharves and Corporation Wharf. It should be noted that this area has recently been reclaimed, and a rehearsal facility for the Theatre Royal has been built on it. Millbay docks were recommended to be developed as a ferry port on the west side, with the inner basin filled in and regenerated as a retail and residential site. New road access from Union Street was also recommended. Road access was improved in 1994 although it is still not ideal, and the land around the inner basin has been sold to SWRDA for re-development (Howard 2003, Lloyd's List 2003b). In 1993 a study for the Atlantic Task Force (Gripaios *et al* 1993) looked at the case for further development of the port of Plymouth. This and other studies on port development in Plymouth and the Southwest (Gripaios and Gripaios 1994, 1995) found no evidence that major development could be economically justified. Trade was moving away from the Southwest to the east coast in response to growing EU trade and industrial concentration in the South East and Midlands.

The most recent report was prepared in 2001 by MDS Transmodal and DTZ Pieda Consulting for the Southwest Regional Development Agency (Maritime Plymouth 2001). The Maritime Plymouth report recommended a study into the building of a cruise terminal at Millbay and a strong recommendation that waterfront land should not be released for non-marine use where it could constrain future developments of the existing commercial wharves.

In the Bristol Channel, the port of Watchet closed in 1994, but Dunball Wharf at Bridgwater is still open to trade, mainly because of its proximity to the M5. Portishead is closed to commerce and so is the old port of Bristol, but Avonmouth and Portbury have flourished since the Bristol Port Company took it over from Bristol City Council in 1991, although it is a long way from its position in the top ten of UK ports that it held in 1965. Sharpness is privately owned and still handling cargo, although Gloucester Docks closed to commercial traffic some years ago.

In Dorset on the south coast, Portland Harbour was handed over from the Royal Navy to private owners in 1996 and it is slowly expanding its operations. Weymouth is now a ferry harbour, while Poole is expanding both its ferry services and bulk handling of steel and timber (Lloyd's List 2003c). See table 3.1 for a list of the remaining commercial ports in SW England.

3.7 Regional Economic Policy

Divergent economic growth within a nation leads to social instability and economic inefficiency. High levels of unemployment within a region, with concomitant net migration of younger, skilled workers, is particularly damaging not only to the social welfare of the losing region but also to the welfare of an overcrowded receiving region (Brown and Burrows, 1977). Government therefore has an incentive to develop policies that encourage economic growth and development within poorer regions (Button and Pentecost 1999).

Port	Location	Traffic 1999[1]	Ownership[2]
Sharpness	Gloucester	700,000 tons per annum	Private/British Water Board
Bristol: Avonmouth and Royal Portbury	Bristol	6,500,000 tons per annum	Company
Bridgwater	Somerset	80,000 tons per annum	Local authority
Bideford	Devon	60 ship visits per annum	Local authority
Porthoustock	Cornwall	No data	Company/trust
Penzance	Cornwall	15,000 tons cargo and 125 passengers per annum	Local authority
Dean Point	Cornwall	398,000 tons per annum[2]	Private/trust harbour
Falmouth	Cornwall		Company/trust harbour
Truro	Cornwall	50,000 tons per annum	Local authority
Par	Cornwall	600 ship visits per annum	Company
Charlestown	Cornwall	47,000 tons per annum	Private
Fowey	Cornwall	1,600,000 tons per annum, 600 ship visits	Trust
Plymouth: Milbay	Devon	1,671,000 tons per annum[2]	Company: ABP
Plymouth: Victoria Wharfs	Devon		Private/trust harbour
Plymouth: Cattedown Wharves	Devon		Private/trust harbour
Plymouth: Pomphlett Jetty	Devon		Private/trust harbour
Teignmouth	Devon	500,000 tons per annum	Company: ABP/trust
Portland	Dorset	No data	Company
Weymouth	Dorset	9,000 ship visits	Local authority
Poole	Dorset	2,300,000 tons per annum	Trust

Table 3-1 Commercial Ports in the Southwest Region

1. Fairplay World Ports Guide 2000
2. DETR 2000a

In the 1960s, the United Kingdom Government implemented regional planning councils such as the Southwest Economic Planning Council. This produced an extensive strategic planning document in 1967, but because the Planning Council lacked the power to implement it, very little resulted. In the 1970s and the 1980s, regional policy within England reverted to the county level, which resulted in a loss of regional strategic vision (Roberts 1993).

In contrast to changing UK policy, the European Union has always been active in working towards regional integration. It has implemented its regional policy with direct subsidies and soft loans (Armstrong and Taylor 2000) and particularly fostered foreign inward investment. In 1989, EU regional policy was re-formulated and the various funds available for regional assistance were replaced with Structural Funds. These have grown enormously since 1989 and the EU is now the most important partner in regional funding.

When the present Labour government came to power in 1997, regional policy once more came to the fore in the UK. Scotland and Wales gained elected parliaments with devolved powers. Although elected regional councils were not put in place in England, eight Regional Development Agencies (RDAs) were created under the Regional Development Agencies Act (1998). They were established in April 1999 with powers relating mainly to economic regeneration, social regeneration, planning and environmental sustainability. A ninth development agency in London was created in 2000 (DTI 2000). All EU structural funds have to be matched by UK spending, which must be administered by regional bodies. This last requirement was one of the major imperatives in setting up the RDAs (Armstrong and Taylor 2000). The Southwest of England RDA (SWERDA) covers the county and unitary authorities of Gloucestershire, Swindon and Wiltshire, Bristol, Bath and North East Somerset, Bournemouth, Dorset and Poole, Devon, Torbay and Plymouth, and Cornwall and the Isles of Scilly.

RDAs have a specific function to formulate regional strategies, which were presented to the Government in 1999. The Regional Strategy for the Southwest of England 2000 – 2010 (Southwest of England Regional Development Agency 1999) includes plans for implementation of a regional transport and development strategy. The local authorities within SWRDA therefore represent a natural choice to define the 'region' within which to investigate regional competitiveness within Southwest England.

3.8 Regional Competitiveness

3.8.1 Regional Competitiveness Research 1980-2001

The concept of regional competitiveness is in a process of development. In one respect it derives from the competitiveness of firms which Porter (1980, 1985) developed into a theory of the competitiveness of nations (Porter 1990). This theory was applied subsequently to inter-regional competition to explain differential economic development within a nation. Porter's model describes four key determinants of the competitive advantage of a nation's firms, which are:

- Factor conditions (land, labour, capital and entrepreneurial ability)
- Demand conditions
- Related and supporting industries
- Firm strategy, structure and rivalry

(Porter 1990)

In addition, the roles of government and chance are recognised. This model provides a useful basis for selecting indicators of regional competitiveness (Charles and Benneworth 1996) but it is open to criticism. Lovering (1999) is critical of the whole concept of regional competitiveness and in particular of the idea that the success of a region can be measured, like the success of a firm, by its relative profitability. While it is true that regions compete with each other for inward investment (Chisholm 1990), the net result at national level is zero, or even a net loss due to the incentives and subsidies offered by the winning region. Therefore, an interpretation of regional competitiveness as firm competitiveness in a regional context is insufficient, although useful as far as it goes.

A second theory uses the label of regional competitiveness to describe the underlying economic strength of a region but rejects the crude competition analogy with firms. The standard of living of the citizens of a region is claimed to be the only viable indicator of competitiveness. Knowledge is the key to raising that standard, and a competitive region, therefore, is measured by its ability to attract and employ knowledge workers. The importance of knowledge is placed in a spatial context by the ideas of agglomeration and embedding (Belleflamme *et al* 1999, Dickens *et al* 1994, Porter 1990, Tödtling 1994). This agglomeration or local clustering of businesses in a related sector, gives economies of scale and scope, but it is also claimed to give an embedded knowledge advantage to a locality, maintained by proximity and local institutions, and vital to innovation. The existence of such clusters is well-documented (Porter 1990, Kanter 1995) but they are not commonly found in peripheral regions. There is also research by Curran and Blackburn (1994) that found a lack of embeddedness in both large and small firms in the UK, bringing into question the locational importance of clusters. Lagendijk (1999) argues that peripheral or non-core regions are better served by general development rather than attempts to develop a locally rooted industry cluster.

Further strands of thought on regional competitiveness focus on innovation (Simmie and Sennett 1999, Charles and Benneworth 1996), local learning (Maskell *et al* 1998) and institutional economics (Amin 1999, Amin and Thrift 1994). These include formal and informal institutions to disseminate skills, learning and innovative techniques and to share values and social norms.

Theories of regional competitiveness have been criticised for a lack of rigour (Markusen 1996) and for harming Keynesian income redistribution and other macroeconomic efforts to increase national economic welfare (Lagendijk 1999, Lovering 2001). The very concept of 'region' is often undefined. However, it is possible to draw from the strands of theory above, the key issues of economic profitability, localised industry, localised technical change and attractiveness for knowledge workers that must inform an investigation into regional competitiveness and the ports of that region.

3.8.2 Regional Competitiveness Research 2002-2006

The existence, nature and relevance of regional competitiveness as a concept are a continuing area of debate in the academic community. The policy makers, on the other hand, have accepted it as a given fact that requires a policy response (Kitson *et al* 2004). The problems may be summarised as:

- What is meant by competitiveness? Is it productivity (labour or total factor), employment, income?

- Can territories compete as firms do, when territories cannot enter or exit the marketplace, and there is no organising institution?
- What are the boundaries of the region?
- What are the mechanisms of regional competitiveness?
- What policy measures can be implemented to improve regional competitiveness?
- Is benchmarking valid?
- Can the strategies of a successful region be replicated elsewhere?

(Boschma 2004, Kitson *et al* 2004, Budd and Hirmis 2004, Lorenzen 2001)

Porter (2003) uses the indicators of wages, wage growth, employment growth and patenting (as a proxy for rates of innovation) to measure relative regional performance. Kitson *et al* (2003) emphasises regional productivity as the measure of competitiveness. Boschma (2004) implies that regional competitiveness is a measure of growth rate and innovation.

There appears to be a consensus that regions cannot compete exactly as firms do, but they are in competition with other regions for investment, productive workers and relative economic success (Kitson *et al* 2003). The boundaries of the region need to be fixed for empirical analysis (Porter 2003) or government intervention, but at the theoretical level Boschma (2004) claims that they are fluid, depending on the context.

There is an emerging consensus that regional competitiveness, measured as regional economic performance, is linked to learning, innovation and the diffusion of tacit knowledge (Boschma 2004, Budd and Hirmis 2004, Cooke *et al* 2005, Döring and Schnellenbach 2006). Tacit knowledge is knowledge that has not been written down, or formalised, or that needs to be interpreted before it can be applied. The learning and innovation leads to an increase in traded employment, that is, employment in industries that sell goods and services to other regions and other countries. Porter (2003) found that, in the United States and during the 1990s, there was a definite correlation between clusters of traded industries and relative regional economic performance. Wages in the traded industries drove up wages in local and resource dependent industries. All traded industries had this effect, not just the high-technology ones. Clusters offer agglomeration economies from a large labour pool; the presence of suppliers and customers; and knowledge spillovers (De Langen 2002). The geographic proximity enables close, informal links and the transmission of tacit knowledge. Another description of the informal linkages within a society is social capital, which "includes shared values and rules for social conduct including trust and civic responsibility" (Iyer *et al* 2005 p. 1016). There are two types of social capital: 'bonding' capital between people with the same backgrounds and social positions and 'bridging' capital that links different social groups. Too much bonding capital can smother growth and change. Bridging capital, on the other hand, is important in creating social harmony and cohesion (Iver *et al* 2005). It could also be a source of innovation, bringing in ideas from other groups and areas.

Each region is unique, with a unique history, factor endowment and combination of social institutions. Regional development is path-dependent. In these circumstances, benchmarking a region against some ideal is of little value, and measures that work well in one region may be ineffective when transplanted to another (Boschma 2004), like moving an orchid to an alien soil that lacks the invisible soil organisms it depends on. Porter (2003) recommends that policy should focus on increasing the productivity of all clusters within a region. Diversity in clusters and companies is also recommended. Boschma (2004) also warns of the dangers of institutions and ways of doing things becoming ‘locked-in’ and unable to change when external conditions change. A region and its policy makers need to be flexible and responsive to change for long-term regional competitiveness.

3.9 Ports and Regional Competitiveness

Ports contribute to regional competitiveness as profit earning businesses and in their function as a facilitator of seaborne trade. There are both economic and environmental reasons to encourage the transport of bulk goods through local ports: it is a low-cost and efficient mode of transport and it keeps thousands of heavy loads off the roads.

Based on the research into regional competitiveness that existed up to 2001, port capacity and port profitability emerged as the two key issues in relation to regional competitiveness. The region must have sufficient capacity to meet the needs of regional port users, or else the trade will be lost or transferred to roads. The ports must also be able to make sufficient profit to cover the opportunity cost of the factors of production, including the physical harbour and infrastructure. Over capacity may not reduce port charges but it will reduce the number of ship calls, and thus revenue, for competing ports. However, ship calls could be increased through innovation or because of changes in the costs of competing modes. Reducing capacity through port closures is frequently irreversible and closes off possibilities for future generations that may face different business and social environments.

The institutional position of seaports, and its effect on learning capacity, was investigated by Stevens (1999). He was particularly interested in the interactions between public authorities and the people concerned with ports (the social actors, to use the technical term) in the wake of wide scale privatisation and reorganisation of ports. Although his research did not relate directly to the regional competitiveness of ports, it did look at the interface between politics and the market within different institutional structures around ports, and their effect on learning and innovation. An innovative port is a sustainable port, able to contribute directly to a region's competitiveness as both a business unit and an enabler of trade.

3.10 Commercial Port Capacity

A commercial port may be defined as a port that is organised with the primary object of facilitating trade (Baird, 2002b). Trade can be coastwise to other national ports, or international, but in both cases, it increases the economic surplus of the trading partners. The traditional view of a port is that it is a public good and a monopoly provider, which is usually owned by a trust, the local government or the State as a safeguard against market failure. It is a terminus where goods are transferred from one transport mode to another. Ancillary functions have grown up in and around ports as the need has arisen, such as storage, aggregation and division, and various types of processing and manufacture, but the essential function is that of the facilitator to trade. It is widely taken for granted that an efficient port is essential to the economic welfare and development of its hinterland. This is the justification for an attitude to ports, characterised by Bennathan and Walters (1979) as the 'European view' that the port itself need not be commercially viable. In contrast, the 'Anglo-Saxon view' is that a port is merely another commercial enterprise that must make at least normal profits.

An efficient port reduces the cost of transporting those goods that pass through it. Transport costs are a trade-resistant factor (McConville 1999). Changes in transport costs change the goods and services that are internationally traded, so that an increase in transport costs will stop the export of some goods by making them more expensive than locally obtained goods in the importing country. Therefore, supporting export industries must also include supporting the cost-efficiency of transport infrastructure, including ports. This can be done through state ownership to prevent monopoly pricing, through subsidy, or through perfect competition and the market mechanism.

Issues of port capacity bring the divergence of views between the 'European' and 'Anglo-Saxon' views strongly into focus. In Europe, port developments receive public grants and they have been maintained through public subsidy. The time frame for returns on investment is stretched up to 70 years in some cases. In the UK, development costs are generally provided commercially with short-term returns required (a ten-year horizon). Unprofitable ports are closed to commercial traffic, despite the complaints of those who, like Grey (1998) see the port as 'forever', a trust held for future generations.

Both Goss (1990) and Baird (2002b) have argued strongly in favour of the port as a purely commercial enterprise. They base their arguments on the case of a port in competition with several other ports for the same hinterland, and thus avoid the justification that the port is essential to trade. Goss looks at the argument that an efficient port increases producers' and consumers' surplus (although much of the gains will go abroad to producers and consumers in the foreland). In a competitive market, ports must provide their services at the opportunity cost of their factors of production. Any higher cost paid directly by port users or indirectly through subsidy and taxation, is allocatively inefficient. An efficient allocation of resources exists when price is equal to marginal cost, which results in the resources of society being used in the way that is most productive for society as a whole.

One reason for the inefficient allocation of resources is the existence of 'public goods' or 'collective consumption goods' (Samuelson 1954) Baird examines the argument that ports are a public good and so must be provided through public expenditure, especially for the provision and maintenance of dredged channels, navigation aids and port infrastructure. Although these exhibit some of the characteristics of a public good because they are non-rival in consumption and to some extent non-excludable, attributes that define a public good (Connolly and Munro 1999), yet the UK still manages to make users pay for them, so they cannot be pure public goods. He also agrees with Goss that the argument that ports produce an economic surplus (or 'value-added') is not exceptional (all free market economic activity produces a surplus) and does not justify subsidy, especially when the subsidised development creates uncosted environmental damage.

The UK, with a long coastline and efficient road transport, is claimed to have far more ports than it needs in terms of national trade (Lloyd's List 1994). Many small ports survived until 1989 thanks to the National Dock Labour Scheme, which made their larger competitors overmanned and inefficient (John 1995). The improvement in efficiency that followed the abolition of the scheme increased competition for all UK ports. This, together with the recession of the early 1990s, led to port closures in Exmouth, Preston and Brentford Dock. Ships are also getting larger as economies of scale affected even the coastal trades. For many small and medium sized ports the choice seems to be a stark one of expand capacity to take larger vessels, or close.

Help may be at hand for smaller ports from the green transport agenda. Sea transport does create negative externalities, but they are far lower than the pollution, social dislocation and environmentally damaging road building engendered by road freight traffic. The EU has now incorporated short-sea shipping into its transport plans, and the UK has made encouraging noises. Freight facility grants have recently been extended from rail to water, offering grants to "any company which wants to move freight by water and which is proposing to invest in new water freight handling facilities or re-invest in existing facilities" (Department for Transport 2002, p.1). They are aimed not only at encouraging a shift from road to water, but also at retaining the present level of water transport to prevent further decline.

3.11 Conclusion

After exploring the policy and commercial background to the research area, the small commercial ports of Southwest England were listed and described. These form the sample population for this research. The concept of regional competitiveness and its application to ports was discussed. From that, the two key issues concerning the regional competitiveness of ports that emerged were port capacity and port profitability. These will be used to provide the first point of entry into the research area. What is needed, in order to explore the properties of these key areas, are examples of ports with no change in capacity and with change, through expansion, and ports that are profitable in as much as they remain open, and that are unprofitable in as much as they have closed. In addition, in order to look at port profitability and firm competitiveness the following areas within each port will be looked at initially, within the framework of Porter's (1990) model of competitiveness:

- Factors of Production
- Demand conditions
- Local maritime industries
- Firm strategy and structure
- Institutional environment

It needs to be emphasised that these ports and the questions based on Porter's model are simply an initial entry into an exploratory field of research. The actual *findings*, as presented in chapter four, need not be the same because they have been discovered in the data, not through a review of literature.

The following chapter explains the exploratory and theory-forming methodology employed for the research. It also details the methods of data collection and analysis.

Chapter 4 Grounded Theory Research Methodology and Operation

4.1 Introduction

This chapter consists of two main areas. The first concerns the justification for and the theoretical underpinnings of the chosen research approach. Grounded theory is a well-established methodology in the fields of social science and health and it has been increasingly used in business research. The second area is the specific application of grounded theory methodology to the research setting. Issues of sampling, ethics, data gathering procedures, and treatment and analysis of the data are explained.

4.2 The Research Approach

This research project uses an inductive and qualitative approach. Induction builds theory from the research data, in contrast to deduction, which tests hypotheses deduced from existing theory (Saunders *et al* 2003). Induction is appropriate for this research because it is exploring an area (small bulk ports, the effect of the social environment on ports) where there is very little existing research or enquiry. There is of course a basic hypothesis that is being tested, which is that both the social and the economic environment are important to a change in a port's regional competitiveness. This sets the research field. What is not known are the precise elements that are important in the port's social and economic environment? Some elements, such as the increase in ship size in the coastal sector, are well known, but because there is so little research on small bulk ports it is possible that other elements are not represented in the literature, so an hypothesis cannot be deduced. Therefore, this project was commenced with an open but informed mind, allowing the data to reveal the theory.

Inductive research generally uses a qualitative methodology: this emphasises an understanding of meanings and contexts, the use of qualitative data and a flexible style of research within a dynamic situation. The researcher is an integral part of the process (Sarantakos 1998, Saunders *et al* 2003). Qualitative research offers rich data from a small number of samples. It is particularly appropriate for descriptive research, exploratory research and research set in a closed system. Marshall and Rossman (1999) cite seven types of research for which the qualitative approach is highly suitable. They include research where the relevant variables have not been identified. The present study involves a limited population (too few to draw meaningful statistical inference) of small ports (less than one million tonnes imported and exported annually), it is exploratory and it is surmised that the relevant variables have not been fully identified. Rich data is available by interviewing stakeholders and decision makers who are readily accessible. These factors justify the use of qualitative methods. The alternative would be a quantitative study using questionnaires in large numbers to produce results that are said to be accurate, testable and repeatable. Apart from the need for a statistically significant number of subjects, there are two problems with such an approach in the context of the present research project. They are that:

- Many of the environmental influences are qualitative in nature, dealing with complex issues such as relationships, motivation and innovation. Ordinal data using a Likert (or similar) scale for questionnaire answers may fail to capture this complexity.
- Quantitative analysis is static and pre-determined. It is not able to respond readily to unexpected findings or a dynamic situation (see Naslund 2002).

4.3 Quantitative and Qualitative Research Paradigms

This research into the small commercial ports in the Southwest of England includes aspects of business, transport, geography, economics and sociology. With the exception of some human geography and sociology, the research tradition in these areas is quantitative. The philosophical foundations for quantitative research lie in the positivist paradigm. Although there are a range of definitions (Sarantakos 1998), a paradigm has been defined as "the assumptions, practices, and agreements among a scholarly community" (Lewis and Grimes 1999, p672). Positivism (in which is included empiricism, which excludes normative questions, that is, areas requiring value judgements) takes its name from the writings of Auguste Comte (1798-1857) which applied the philosophy of science to social science (Wacquant 1993). Knowledge of society is sought in the form of laws or hypotheses, which can be verified through experimentation, observation and manipulation or comparison (Wacquant 1993, Lincoln and Guba 2000). At its most extreme, the positivist paradigm rejects all qualitative research as 'unscientific' and invalid. Social scientists who sought academic respectability for their work in the early years of the twentieth century adopted positivist, quantitative methods with strict observer neutrality (Sarantakos 1998). Although sociology did gain a respected position within universities, there were many critics of the rather mechanistic, narrow methods used and the requirements of objectivity and observer neutrality. In the second half of the twentieth century the humanities moved away from a rigidly positivistic view of the universe towards post positivism: the modern view that reality exists but the researcher may not be able to grasp its social dimensions fully. As with positivism, prediction and the testing of theory are important, but the value of qualitative research for description and theory formulation is recognised (Lincoln and Guba 2000).

Qualitative paradigms have arisen because some social researchers reject the underlying assumptions of positivism. Various paradigms have developed from the German *Verstehen* (understanding) approach (Frankfort-Nachmias and Nachmias 1996) and symbolic interactionism (see below) (Sarantakos 1998, Annells 1996). There is no agreement among scholars as to the exact names, numbers or attributes of these paradigms. Sarantakos identifies an 'interpretive perspective' as the dominant, recognised qualitative paradigm and the 'critical perspective' (Marxism, feminism) as a third, emerging paradigm. Lincoln and Guba (2000) use the word 'constructivism' instead of interpretivism; they acknowledge the critical paradigm and add a fourth, the participatory paradigm, based on Heron and Reason (1997). Other authors use a single word to describe the general qualitative paradigms such as Hammersley's (1992) use of the word 'ethnography'.

Interpretivism or constructivism describes a universe where social reality is a construction of human consciousness through the assignment of meaning. All research is subjective and informed by the researcher. There is no absolute truth and no absolute laws waiting to be 'discovered'. Instead of discovering laws, the purpose of research is to understand the social situation. Research methods are qualitative, rich in data, narrow in scope and rooted in the particular. Values are made explicit and action is an expected outcome of the research.

Symbolic interactionism is a perspective within interpretivism. It consists of a set of theories about the human actor in a socially constructed world. Humans are self-aware and capable of guiding their own behaviour. They engage in interaction with society, through which they learn the symbolic meaning of objects (Denzin 1989).

This research project is located on the borderline between post positivism and symbolic interactionism, which Saunders *et al* (2003) describe as realism. Within this research philosophy, it is postulated that both a physical and a social world exists independently of the human actors. External events and some objective truths impinge upon the actors, but elements of their world are socially constructed through interaction, with a learned meaning, and these meanings in turn shape the organisations in which the actors operate.

4.3.1 Research Methodology

Grounded theory has been selected as an inductive, qualitative methodology that is capable of exploring both facts and the meanings attributed to a social situation by the actors. It is explicitly theory building. The categories and concepts are grounded in the data, which gives them validity in the real world, but the interpretation and construction of theory results from the researcher's interaction with the data. This interaction is not random but formalised in a specific technique of labelling and categorising, as 'discovered' by the founders of grounded theory, Strauss and Glaser (1967).

Grounded theory is *not* the same as thematic research although some commentators confuse the two (see Liamputtong and Ezzy 2005 p.259). Thematic research uses qualitative data, usually interviews, just as grounded theory does. It also takes the data labels (known as themes and sub-themes) from the data as grounded theory does. However, when using a thematic method, the researcher gathers all the data before beginning the analysis (normally through purposive sampling, that is, non-probability sampling based on the judgement of the researcher so that certain types of cases are selected in advance). In grounded theory, analysis begins as soon as the first interview is transcribed, and later sampling is theoretical, driven by the emerging theory. In thematic research, the interviews are read through all together and the themes and sub-themes taken from this reading. The researcher then labels the significant data fragments within the interviews and analyses the results within the framework of the themes. This is similar to grounded theory except that with grounded theory, categories and concepts are formed and changed during the process of analysis to produce an emerging theory.

4.3.2 The origins of Grounded Theory

Grounded theory derives from the work of Anselm Strauss and Barney Glaser in the 1960s. They studied the sociology of dying in American hospitals (Glaser and Strauss 1965) using qualitative methods designed to create new theory that was 'grounded' in the data. In 1967, they published "The Discovery of Grounded Theory" and began to disseminate their methodology to the academic community (Glaser and Strauss 1967). This community was originally made up of sociologists, but since then the use of grounded theory has spread to nursing and other health studies (Chenitz and Swanson 1986, Strauss and Corbin 1997), education (Taber 2000), geography (Bailey *et al* 1999), business research (Turner 1983, Pandit 1995, de Burca and McLoughlin 1996, Costa 1997, Grant 1998, Singh 1999 and Dunford and Jones 2000) and logistics (Golicic *et al* 2002). Grounded theory has developed into two distinctive styles, each led by an original founder. The late Anselm Strauss, working with Juliet Corbin, developed a more formal, technical approach (Strauss and Corbin 1998) which can be applied to verification as well as theory discovery (Rennie 1998). Glaser, on the other hand, maintains the emphasis on induction and on a more flexible, unforced approach to analysis (Locke 2001). He continues to publish books, teach at seminars worldwide, and supports an electronic journal, 'The Grounded Theory Review' as well as the Grounded Theory Institute.

4.3.3 Grounded Theory in Practice

The practice of grounded theory methodology involves labelling data segments (phrases, sentences or other significant fragments) with labels that arise out of the data, rather than being pre-selected. A process of constant comparison of data, aided by the use of memos to record the analytical process, leads to the generation of theory through the combination of labels into categories, and combining of categories into concepts. Analysis is an iterative process that begins with the first collected datum, and continues through theoretical sampling (that is, samples chosen to explore aspects of the emerging theory) until a state of theoretical saturation is reached – that is, each new piece of datum simply confirms the categories and concepts already achieved. The researcher is advised to approach the research without preconceived theories and ideally before a literature search has been conducted (Hickey 1997). The literature then becomes secondary data to be analysed alongside the primary data. However, the researcher also has to be sensitised to the data, either through personal experience or through reading some of the background information that is available.

The process of a grounded theory research project differs from traditional research in several important aspects. The following are likely to cause particular problems for those who are not familiar with grounded theory:

- *Literature search* – before the research, it is only used to select and become familiar with an area of investigation.

- *Hypothesis* – it is important not to commence the research with an hypothesis. The researcher must be open to the data.

- *Sampling* – an original sample has to be chosen, as the research must begin somewhere. As categories and concepts emerge from the data they will indicate further areas of investigation, samples that might either confirm or be exceptions to the concepts. This is theoretical sampling.

- *Planning* – it follows that a detailed research plan cannot be made in advance.

The validity of the theory that emerges from a grounded theory project is dependent on that theory being generated solely by the data. However, the researcher must have an area of research that she understands (theoretical sensitivity). Clear opening questions to guide the early data collection phase are also useful. Figure 4.1 illustrates the path of a grounded theory research project and compares it to a typical quantitative and qualitative pathway.

Further information on grounded theory is available from Glaser (1978, 1998, 2001), Glaser and Strauss (1967), Strauss and Corbin (1997, 1998) and in particular from Locke (2001) *Grounded Theory in Management Research*.

4.3.4 The Theoretical foundations of Grounded Theory

Grounded theory is a qualitative methodology, although quantitative data can be included in the analysis. It is harder to place this methodology within a specific

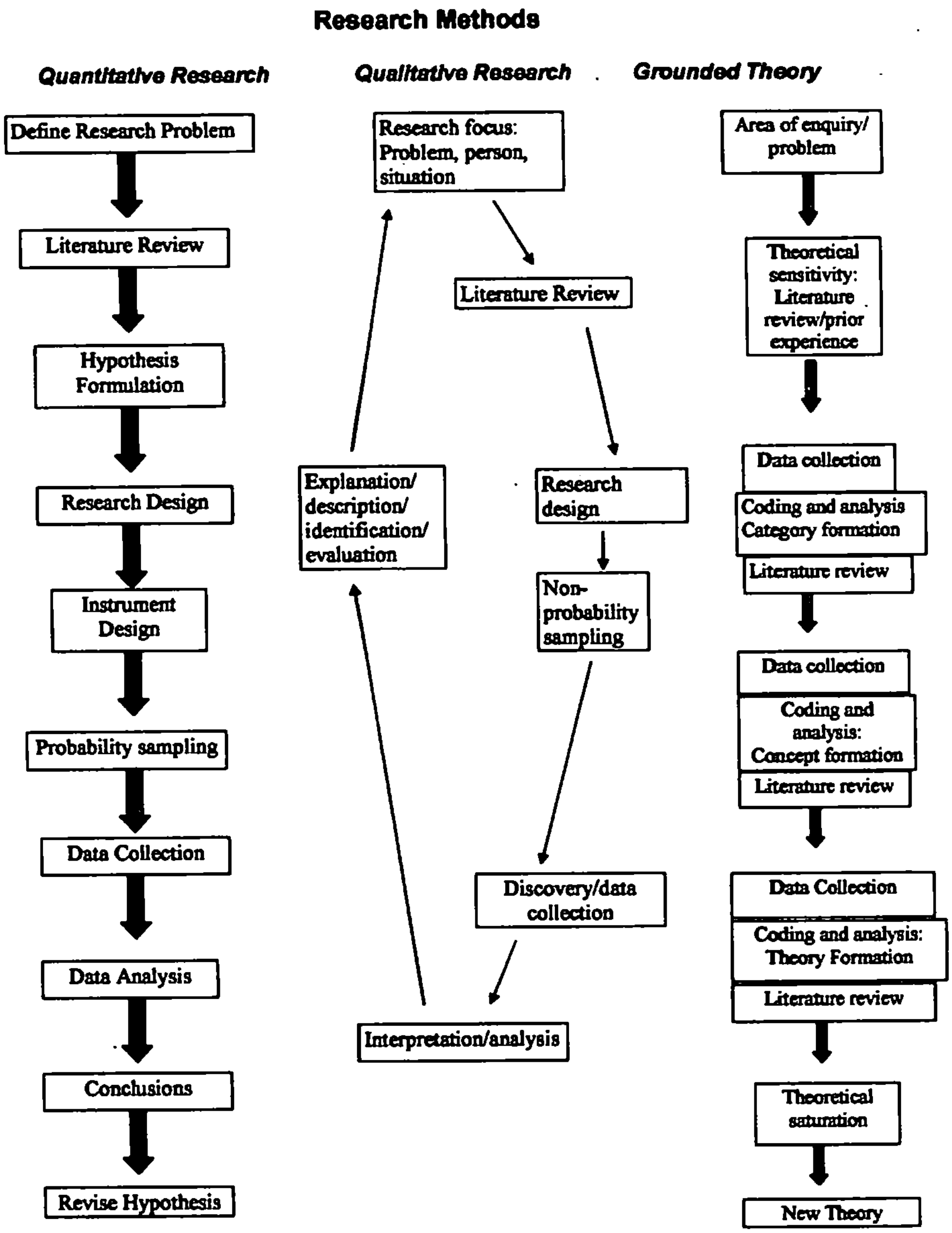


Figure 4-1 Comparison of Research Methods

paradigm. Chenitz and Swanson (1986) explicitly place grounded theory within a framework of symbolic interactionism, as do Annells (1996), Baker *et al* (1992) and Locke (2001). Baker *et al* claim that the conduct of grounded theory research that is not located in symbolic interactionism leads to 'method slurring'; they imply that it reduces or even negates the validity of the research results. Annells makes the point that the methodological divide between Glaser (1978, 1998, 2001) and Strauss and Corbin (1997, 1998) is almost certainly the product of a divergent theoretical perspective. Charmaz (2000) claims that the original grounded theory methodology and Glaser's interpretation is positivist, and then places Strauss and Corbin within a post positivism paradigm. Glaser himself, when asked by the author at a seminar in Paris in 2002, ignored the question or stated that it was irrelevant. Corbin and Strauss (1990) state that grounded theory is derived from pragmatism and symbolic interactionism. It seems that grounded theory has been developed and largely used by researchers within symbolic interactionism, so that although it is accessible to the post positivist or realist researcher, the assumptions of symbolic interactionism inform the methodology. Two assumptions highlighted by Corbin and Strauss are those of change, as opposed to a static social world, and the assumption that actors have some choice, some control of their destiny based on their perceptions of the world.

4.4 The Research Setting: Small Ports in Southwest England

The Southwest is one of nine English regions. It has the longest coastline of all the English regions but only one major port, Bristol. Most of the region's ports are very small and they tend to serve economically disadvantaged areas such as Cornwall, Devon and West Somerset. It is a peripheral region, which becomes progressively less prosperous and more inaccessible towards the West. Devon, Cornwall and Somerset (although not the region as a whole), belong to the Conference of Peripheral Maritime Regions of Europe (CPMR). This organisation was created in 1978 to reduce the disparities in competitiveness between the peripheral maritime regions and the economic heartland of Europe (CPMR 2004). These factors give the region a number of small commercial ports (less than one million tonnes of cargo handled annually) that could possibly make a significant contribution to regional competitiveness under the right circumstances, which is why it was chosen as the research setting. In addition, the findings in this region will be generalisable to similar peripheral maritime regions, such as those within the CPMR.

In chapter three, the small commercial ports of S.W. England were listed and described. These form the sample population for this research. Purposive sampling, based on the findings from the literature review in chapter two, was used to select individual ports to provide two examples each of a port that has increased capacity, maintained capacity, closed and re-opened, and closed permanently (see table 4.1). *This selection was intended as no more than a guide for the early stages of the research.* Theoretical sampling in fact resulted in some of these ports being used and some outside the list being used.

Port	Decision
Exmouth	Permanent closure
Watchett	Permanent closure
Porthoustock	Closed and re-opened
East Yelland Jetty	Closed. Proposal to re-open
Par	Maintained capacity
Dunball Wharf	Maintained capacity
Teignmouth	Proposed increase in capacity
Victoria Wharves	Proposed Increase in capacity

Table 4-1 A Selection of Ports for Investigation

4.4.1 Selection of Interview Subjects

Interview subjects were taken from amongst those people who are typically most closely involved in, or affected by, the decision making at a port:

- Port manager
- Harbour manager
- Port owner
- Local Authority (may also be the port owner/harbour manager)
- Local residents' association
- Primary port user (may also be the port owner)

Sampling of interview subjects, like the sampling of the ports themselves, was on a non-probability basis. That is, there was no attempt at representation or objective choice. This is standard procedure for exploratory and qualitative research (Sarantakos 1998). The choice of the *first* port and interview subject was purposive. What was sought was an individual with a wide knowledge of the current issues relevant to the economic and social situation of a small commercial port and of the factors leading to a decision to change the capacity of the port. Exmouth closed in 1989 and Watchett in 1993 and the economy has changed since then. Par and Dunball Wharf are maintaining the current capacity. Porthoustock has re-opened but it only deals with stone cargoes. The status of East Yelland was uncertain at the time the research commenced. The choice was then between Teignmouth and Victoria Wharf as ports, and the port manager as the individual with the widest knowledge. In the end, the port manager of Teignmouth was chosen because the proposed changes to the port were substantial and the port handled a variety of cargoes.

Subsequently, theoretical sampling was used to guide the choice of ports. Victoria Wharf was the second site, then the two closed ports of Watchet and Exmouth. An initial individual with publicly available contact details was chosen from amongst the list of stakeholders given above.

Port	Interviewee	Position	Date	Place	Code
Teignmouth	Colin Greenwell	Port Manager, Teignmouth and Plymouth Millbay	23/4/02	Plymouth ABP Offices	A
Plymouth Cattewater (Victoria Wharf)	Tim Charlesworth	Harbour Master	24/11/03	Cattewater Harbour Office	B
Victoria Wharf	Dave Petherbridge	Dock Manager	24/11/03	Victoria Wharf Harbour Office	C
Victoria Wharf	Owen Clegg	Wessex Grain, Shippers	22/03/04	Wessex Grain Offices	D
Exmouth	Keith Graham	Dock Master	22/03/04	Exmouth Dock Master's Office	E
Watchet	Bruce Lang	Port Owner: Local Council Officer	24/06/04	District Council Offices	F
Exmouth	Sybil Cardy	Local Councillor	29/06/04	Her home, Exmouth	G
Watchet	Chris Muller	Retired Harbour Master	1/07/04	His home, near Watchet	H
Watchet	Ben Norman	Local Resident	1/07/04	Watchet Maritime Museum	I (Not used)
Exmouth	Nick Pawson	Chairman, Exmouth Residents' Association	2/07/04	His home, Exmouth	J
Exmouth	Keith Smith	Secretary, Exmouth Dock Residents' Association	2/07/04	Exmouth Dock	K
Teignmouth	Allie Clark Gordon Smith	Local Council Officers	7/07/04	Council Offices, Totnes	L
Porthoustock	Gordon Kent	Senior Falmouth Pilot	4/04/05	His home, Falmouth	M
Truro	Andrew Brigden	Harbour Master	28/04/05	Truro Harbour Masters Office	N

Table 4-2 Interview Subjects

The initial contact was then asked to recommend other contacts amongst the stakeholders (snowball sampling). Table 4.2 lists the interviews that took place in the course of this research. The fact that the actual course of the research did not match the original design is not a weakness of the research. On the contrary, it is a hallmark of good qualitative research, which, as Janesick (2000) observes, is fluid in design up to and including the writing up phase.

4.5 Ethical Issues

Interviewees were usually contacted by telephone to arrange an appointment. The exceptions were the interviews with Ben Norman and Keith Smith who were met at the port town. The nature and purpose of the research was explained and permission was sought to record and make notes of the interview. In all cases, informed consent was gained. The port manager of Par asked for a written list of questions, but as he failed to respond to this letter (even after some prompting), he was deemed not to have given consent and the interview was not pursued. Sometimes during the course of a recorded interview, the interviewee indicated that some comment was not to be reproduced. This, together with the usual 'ums and ers' and some verbal ticks were left out of the transcripts: exact transcripts were deemed unethical because they violated the subject's privacy and human dignity, because all direct speech is grammatically incorrect, full of inconsequent sounds and unnecessary repetitions. A copy of this transcript was then sent to the interviewee for approval. In many cases, there was no response, which was taken to mean that the transcript was accepted. Mr. Bruce Lang, Mr. Nick Pawson and Captain Andrew Brigden requested minor changes to the transcript of their interviews, which were made to the final version. An example of Captain Brigden's request is recorded in Appendix A. Mr. Ben Norman refused permission for his interview to be used after seeing the transcript and all records of it were destroyed. His book, a history of Watchet port, was used instead as a secondary source. Some private opinions could have caused harm or distress if published and therefore the decision was made not to bind any of the transcripts into this work. Permission was asked to include quotations from the transcripts and these are to be found in the analysis chapters.

4.6 Asking the Questions

In quantitative research, the same interview guide is used for each interview or questionnaire so that responses can be compared. In grounded theory research, it is helpful to enter the field with an interview guide derived from the literature or experience, but this guide must then give way to questions based on the emerging concepts. In all cases, questions should be open, allowing the interviewee to volunteer information that is important to him. The interview process should also allow the researcher to explore issues as they arise (Strauss and Corbin 1998).

4.6.1 Researcher Bias

The essence of a grounded theory analysis is that concepts and connections arise from the data, rather than being imposed upon the data by a pre-determined hypothesis. However, the analysis does not happen by itself but through the researcher who must be able to make a meaningful conceptualisation from the raw data segments. In other words, the researcher needs to know enough about a subject to extract the concepts from the data (theoretical sensitivity) but not so much, or have so many ready-made ideas, that the data is forced to fit chosen concepts.

In qualitative research, it is recognised that bias always exists. Valid qualitative research requires an explicit recognition of the sources of bias that have been created by culture, gender, class, training, experience and personal inclination, as well as analytical techniques. This recognition can 'flag up' an invalid intrusion of bias into an analysis. In this research project, there is only one (female) researcher with the following bias by training and experience:

- Trained as a Merchant Navy deck officer and in maritime business, ports tend to be perceived as both a facility for ships and a business or an element in a supply chain.

- Ships and shipping are desirable, necessary and sustainable.

- Ships and ports are inherently interesting and valued by the port communities.

- The bulk trades involving small ports and small ships serving peripheral areas struggle to survive in the current economic climate.

- Recently trained as an economist, neoclassical economic theories frame the perception of the business world.

- Trained in institutional as well as neoclassical economic theory, individuals are seen as embedded in a society that actively shapes their economic behaviour. Economic changes are path dependent and motivation is more likely to involve satisficing than maximisation.

4.6.2 The Process of Data Collection

Each interview was set up by appointment and took place at the workplace or home of the interviewee. An interview guide was prepared in advance but it was not slavishly adhered to if new issues were raised or some question appeared inappropriate at the time. The interviews were mainly taped but in some cases, notes were made at the time and later written up. Interviews were then transcribed from the notes and tapes. The transcripts formed the raw data for analysis.

Recording of interviews is necessary to produce reliable data and as a means of avoiding bias (Saunders *et al* 2003). Both note taking during the interview or taping (with the permission of the interviewee) are accepted means of recording. Notes need to be written up soon after the event and, unless made verbatim, depend on the researcher's memory for their accuracy. They provide an important back-up in the event of technical failure of recording equipment. Taping provides a permanent and accurate record of what was said but making transcripts is time-consuming and laborious. It is said that taping inhibits the interviewee. That may well be the case for socially disadvantaged individuals but the experience in this research was that the tape was quickly forgotten by both parties and apparently full answers were given.

4.6.3 The Opening Questions

The research relates to ports in Southwest England and regional competitiveness. Specifically, it is exploring the port capacity decision. From the literature as reviewed in chapter three, the determinants of a port's regional competitiveness were:

- Factors of Production
    - Physical limits of the port including maximum length, draft and limiting tides
    - Land available for port development
    - Landward access by road and rail
    - Labour availability: working practices: skills
    - Social factors affecting labour recruitment such as housing, quality of life
    - Availability and cost of capital
- Demand conditions
    - Size of hinterland
    - Competition from road and/or rival ports
    - Market for imported/exported goods
- Local maritime industries
- Firm strategy and structure
    - Nature of ownership
    - Motivation of controlling entities
    - Innovation and port development
- Institutional environment
    - Relationship with local business
    - Relationship with local political body
    - Regional relationships
    - National policy environment
    - Supra-national policy environment

These determinants led to the first interview guide, for the port manager at Teignmouth, with the questions being as follows:

Q. I am researching the concept of the regional competitiveness of ports in the Southwest. I have isolated a number of key issues, which are said to affect competitiveness. I would be grateful if you could talk about these issues in the context of the port of Teignmouth.

The physical site of a port imposes restrictions on such matters as: the maximum size of a ship that can enter, the tidal window for port movements, the land available for development, your land-based transport links and so on. Can you tell me how you deal with these restrictions?

Note: this was an open question asking about the first three factors of production.

Q. How easy or difficult is it to raise the capital needed for major investment?

Q. What about access to capital from any other source? Grants or anything like that?

Q. Does the position of this port in the Southwest affect your ability to raise capital?

Note: these three questions all explored different aspects of the availability of capital, particularly whether it was affected by the peripheral position of Teignmouth.

Q. What is the size of your workforce?

Q. Do you have problems with recruitment? With a skilled workforce?

Note: these questions explored the issue of labour as a factor of production.

Q. You have machinery workshops don't you?

Note: this question arose out of the previous response.

Q. Do you actively look for fresh customers, and if so where do you look?

Q. How much competition do you face from other ports, either locally or large ports and road haulage?

Note: these questions were exploring demand conditions.

Q. How much of what you do is driven by your large customers? How dependent are you on, for example, Watts Blake and Bearne, which has faced restructuring problems?

Q. I've been looking at the financial data; the latest I have dates from 2000, and they weren't making as big a return on their capital as some other businesses.

Note: these questions were exploring the institutional environment and were based on background research into the port's main customer.

Q. Do you have a long-term vision for the port of Teignmouth?

Q. How important is innovation and development to achieving that vision?

Note: these questions related to innovation and port development within the port's strategy.

Local maritime industries were not explored due to a lack of time and because they were not relevant to the answers that were being given. The nature of the port ownership was already known. Motivation was touched upon in answers to other questions. Questions about the policy environment were not asked because of lack of time, and they did not appear to be appropriate for this interview.

4.6.4 Later Questions

Questions were tailored for the viewpoint of the interviewee (i.e. harbour master, shipper, local authority or local resident), the circumstances of the port involved and to gain more data on emergent issues. Each interview schedule was different and the researcher was able to ask extra questions or abandon questions that appeared irrelevant. For example, for the second interview with the Cattewater Harbour Master the questions were originally concerned about conservancy issues (the physical limitations of the port), which are the responsibility of the harbour master, and about the reaction of the harbour master to expansion by the wharves within the Cattewater. Finally, exploratory questions were asked to discover any other relevant issues that were important to the interviewee and to find out about commercial activity within the Cattewater. The questions were as follows:

Q. Here in Cattewater you have Victoria Wharf, Cattedown Wharf, Pomphlett Jetty and Howard's Quay as well which I believe takes some cargo.

Q. I wondered if you could tell me anything about them because from my research they have all been undergoing some expansion. From your point of view as the harbour master, you are responsible for the dredging and the conservancy?

Q. Really, I'm looking for your point of view on the issues of expanding capacity in the Cattewater and whether you think there's any potential for future expansion, and when a wharf puts in an application to expand what do you look at?

Q. Where do you dispose of it [*dredging spoil*]?

Q. Is there any talk or have there been any proposals to actually deepen the channels?

Q. How would capital dredging, how would that have to be financed?

Q. You said environmental: is there a particular environmental group or spokesperson?

Q. Are there any local residents' groups that are active?

Q. How do you see the future of Victoria Wharf and Cattedown, just carrying on as they are?

Q. The new berth at Victoria Wharf: how does that impact on yourself and your work, how are you involved in the planning stage?

Q. Is any modelling done of the effect of the new wharf on the water flow and that side of things?

Q. Is there any other general comment that you would like to make?

[*Ships are getting smaller*]

Q. What's the actual constraints; is it draft?

Q. How are you defining the region [*for the Southwest Ports' Association*]?

Q. Is there much going on at Pomphlett quay at the moment?

Q. Where exactly are Sea Structures and Howard's Quay?

Q. I have seen it called Howard's Wharf or Howard's Quay [*Commercial Wharf*].

Q. And Sea Structures?

The interview with the shippers, Wessex Grain, was mainly concerned with fact-finding and, from an economics point of view, discovering the market structure of the industry. The questions were as follows:

Q. What does your firm do, exactly?

Q. Is that just Victoria Wharves in Plymouth or do you use any of the other wharves in Plymouth?

Q. How do you choose which port you export from?

Q. Where do you export to? Who are the importers?

Q. Why is the quantity exported through Victoria Wharf down?

Q. What is the nature of your relationship with other agri-bulk firms, how do you set your prices, for instance?

Q. Do you belong to any trade associations?

Q. What about assurance schemes?

Q. Do you handle the grain that goes through Plymouth, or just ship it and trade it?

Q. Did you build the silos in Plymouth, or did Victoria Wharf? How long does a silo last?

Q. Would you move to another port for your Devon and Cornwall exports if the port pricing went up by too much?

The interviews concerning Watchet and Exmouth were mainly concerned with discovering the narrative of the port closure from the point of view of each interviewee. In these and later interviews, emergent issues of competition, cargo types and their problems, conflict between residents and the port, motivations of the decision-making actors and the social and economic effects of closure were also explored. The final interview, at Truro, was extremely long and covered all the relevant categories that had been identified and defined in the data. Although it amplified these, there were no new categories and so theoretical saturation was achieved.

4.7 Treatment of the Data

Each taped interview was labelled with a letter and this was recorded in the research diary together with the name of the interviewee, the date and place. Notes were recorded in the research notebook. From these a transcript was prepared as close as possible to the original interview. This was then checked against the tape to ensure that punctuation was natural and reflected the meanings conveyed by the tone and inflection of the voice. Names were also checked to ensure accuracy. For example, Wessex Grain was originally heard as Basset's Grain. A search of local agri-business company names eventually yielded the true name, which was then re-checked and confirmed against the tape (in some cases, correct names or spellings came after the interviewee read the transcript). The transcripts were then reduced to the content needed for analysis. How much is removed depends on the aims of a research project. In this case, non-linguistic observations were not included, nor were silences, pauses, or interruptions that did not impede the flow of answers. Hesitations, repetitions and some verbal mannerisms were omitted, although elisions of speech, grammatical errors and incomplete sentences were included, with an explanation where meaning was unclear. What was left was a text where the meanings of the words were the required data.

As explained in section 4.4 the transcripts were sent to the interviewee for approval and changes made when they were requested. Finally, the transcripts were formatted with a standard font, double line spacing, page margins (with an 8cm margin on the right side for manual labelling on the transcript), page and line numbering and a heading. The heading recorded the date, the name and job title of the interviewee and the place.

4.8 Analysis of the Data

Data analysis can be performed manually with or without cards, or computer software can be used to conduct or to aid the analysis. The Word© word processor programme is a simple but powerful tool for labelling and re-ordering data fragments, but greater sophistication can be gained by the use of specialist qualitative analysis programmes. However, Glaser strongly recommended manual analysis for its flexibility and his advice has been followed in this case.

4.8.1 Labelling Data Fragments

The first stage of analysis was to read and re-read the transcript, becoming immersed in its meaning. Then data fragments (phrases, sentences or more) were underlined to indicate that they had meanings that were relevant to the research question. Each data fragment was given one or more labels (a very simple level of abstraction) for the concept that it represented in the context of the transcript. Some labels recurred in the first transcript while others were used only once. This labelling is the equivalent of coding data in quantitative or thematic research. For the sake of clarity, the use of the word 'code' is avoided here, however, because Strauss and Corbin (1998) use the word coding to describe a *process within the analysis*, rather than the attachment of labels to data fragments.

Strauss and Corbin (1998) also recommend the technique of microanalysis, word-by-word and line-by-line for the earliest stage of analysis. That means labelling every single word and line in a transcript. The inexperienced researcher very quickly drowns in data with this technique. Allan (2003) found this an impossible system and Glaser does not recommend it. For business and management research, at least, a system of labelling only key points provides a more effective system of analysis, and earlier conceptualisation.

An example of labelling from a later interview, with Mr. Dave Petherbridge, manager of Victoria Wharves, is given below:

R. Certainly an MD looks at the figures and thinks this is lovely we got to get to it. But	*Management attitude*
certainly we're slightly restricted to the sort of industries that we can chase down here	*Types of cargo*
because we are sort of out on a limb in certain respects.	*Problems of a peripheral position*
China Clay and agriculture really is what we've got to push at and as	*Importance of core cargoes*
long as we can provide a service for these guys then the future's looking good.	*Importance of service*

4.8.2 Categories and Concepts

The next stage was to break the data fragments out of the transcript. Each label was written up as the heading of an index card and the fragment or fragments written underneath. Each data fragment was identified by interview, page and line number. The use of index cards is a procedure recommended by Turner, based on his extensive grounded theory research into business and organisational issues (Turner 1981, Martin and Turner 1986). The cards can be laid out, examined for connections, for similarities and differences. Labels relating to similar concepts were placed into categories and the categories were named. Early categories to emerge were the cargo types Agri-bulks, Clay Cargoes and Other Cargoes. Each cargo type had its own competitive environment, history and handling needs. Then there were categories for varying issues of competition and price, physical aspects of the port, investment issues and social issues. The interrogation of the data was recorded in memos in the research notebook. Early memos simply interrogated the properties of a category. Memos that were more theoretical attempted, even from the first analysis, to achieve a higher order of conceptualisation with some explanatory power. Diagrams are a powerful way to capture conceptual ideas and these were used in theoretical memos.

The analysis was a fluid process of interview, transcription, labelling, categorising and memo writing, then returning to earlier transcripts to check on further labels as issues emerged, or to split or merge earlier labels. Although each new transcript had labels given to the data fragments that arose from the data and their context, many of the same labels used for previous transcripts recurred. Categories also recurred or changed as more data was added. As the analysis proceeded, the categories began to be grouped into higher orders of concept, with either *in vivo* names (arising from the data) or theoretical names taken from existing literature and this process was captured in the memos and diagrams.

Once categories began to be stable and persistent over a series of interviews, they were defined. This clearly set their properties and limitations. It allowed for faster analysis of fresh data; the search for confirming instances and for exceptions to these rules. In the process of defining a category, some data fragments were moved because, on examination, they did not 'belong'. Others were added after the early transcripts had been interrogated again.

From the first interview analysis, categories were grouped together into concepts. These concepts were fluid and changed several times during the analysis, as recorded in the next chapter. The earliest concepts and conceptual diagram were based on the data but informed by the early literature search recorded in chapter three. Later concepts came more from the data. The final conceptual ordering can be justified entirely from the analysis of the interviews. This ordering and the analysis of data from the primary sources (interviews) and secondary sources (newspapers, internet etc.), are presented in chapter five.

4.8.3 Use of Literature and Other Secondary Sources

All types of data are relevant to a Grounded theory analysis. During the course of the research, a considerable amount of data was collected from 'grey' sources such as unpublished leaflets and consultants' reports, as well as information from newspapers and specialised internet sites. Literature from academic sources was also collected. These sources were analysed alongside the analysis of the primary data and, where directly related, they are presented with that analysis (using italics to make it clear that the information comes from secondary sources).

4.8.4 Comparison as an Analytic Tool

Constant comparison is a hallmark of grounded theory analysis. This exists at several levels. At the most basic level, one piece of labelled data is compared to others to find similarities that allow them to be placed within the same category. This was done by laying out the index cards on a large table and reading them through, then grouping together those cards with similar properties. After each stage of analysis, the early interviews were compared with the new categories and concepts to see if they 'fitted', and to see if some category of the data had been missed in the earlier analysis.

Theoretical comparisons open up the researcher's thinking about a particular concept and act as an aid to the formation of theory. Using experience or the literature, something from the research is likened to a concept from everyday understanding or from another discipline. Using some academic literature from the new area, its properties are opened out and then applied to the research concept as a way of gaining a greater understanding of the properties of the concept. An exploration of comparisons was made during the analysis.

4.8.5 Theory Building

At every level of grounded theory analysis, the researcher must move on quickly from categorising and describing to theory building. The ultimate goal, when researching within a social framework, is to integrate the data into an overarching theory (Strauss and Corbin 1998). Where, as here, grounded theory is applied within a broader economic as well as social context, a single theory may not be feasible.

In the following chapters, theoretical constructs and conceptualisations of underlying process are presented as part of the analysis. They are then drawn together in a discussion of the findings in chapter eight where the final theories are presented, based on the analysis.

4.9 Conclusion

The nature of the research question, which is exploratory and inductive, and intended to build theory around the economic and social setting of a few small ports within the Southwest of England, justifies the use of Grounded theory methodology. Grounded theory is a qualitative methodology with its roots within symbolic interactionism, although accessible to both the post-positivist and interpretivist researcher. It is a unique method not to be confused with thematic research or any other of the myriad types of qualitative and inductive research methods. There are two schools of grounded theory: this research is based on the more open, less prescriptive school of Glaser (1998) although it refers to the more prescriptive work of Strauss and Corbin (1998).

Chapter 5 Grounded Theory Analysis

5.1 Introduction

This chapter explains how the data were placed into higher levels of abstraction in order to complete the analysis. It acts as an introduction to the next two chapters, which present the analysis of primary and secondary data at the level of the category, and chapter eight, which completes the analysis at the conceptual level.

5.2 Forming Categories and Concepts

Grounded theory analysis starts with the first interview. Some categories were formed at this stage, although they were open to change until the analysis was completed. Categories were then organised into groups where there appeared to be some kind of conceptual linkage, although these changed considerably during the course of the analysis. *The groups came from the data.* Tentative theories were also created.

After interview C, the categories were placed into two groups:

1) *Factors of productivity* consisting of Labour and Land and Capital
2) *The Environment:* including planning and commercial matters

Figure 5.1 shows a model of the early conceptualisations. This model still holds true after the completion of the analysis, but it is incomplete.

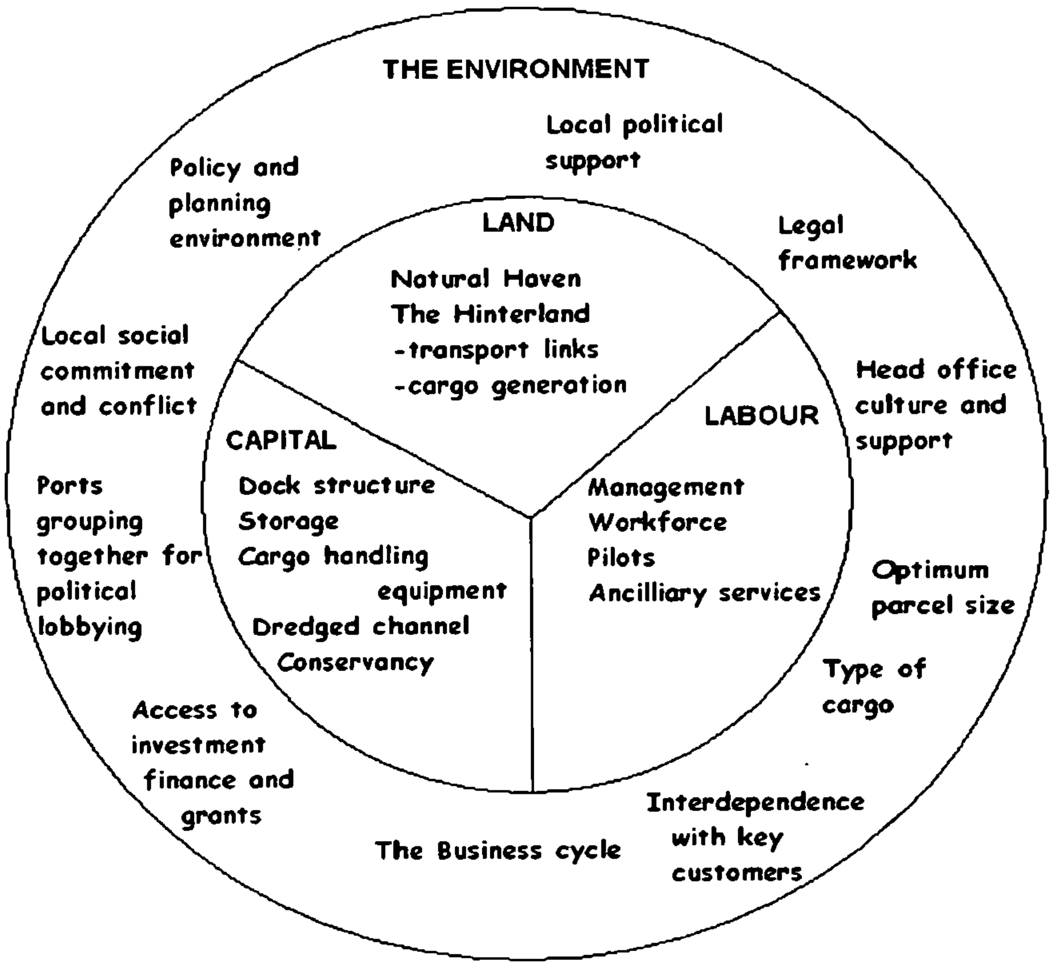


Figure 5-1 Early conceptualisation

After coding and categorising interview 'F', the grouping into the earlier concepts of 'factors of productivity' and 'the environment' was elaborated into five, because the data had grown:

- *The Working Port:* issues to do with cargoes, port competition, the supply chain, land and storage, marketing, harbour upkeep, employment and working conditions.
- *Politics:* this concerns stakeholders such as shipowners, the harbour authority and the public, the regional context and the character of a port town.
- *Port Development:* development plans, investment in the port, the management and ownership, berth capacity and storage capacity.

- *Port Problems:* issues which could lead to port closure or at least affect profitability; changes in the external environment including ship size; tidal limits and drying berths; dredging costs and constraints; environmental concerns; inland transport links, and costs and pricing.
- *Closure and after:* how and why the port closes, after closure and conversion to a marina.

The final ordering into categories and concepts can be seen in figure 5.2 and table 5.1. This consists of three interlinked areas of 'the commercial port', 'public and politics' and 'waterside regeneration'.

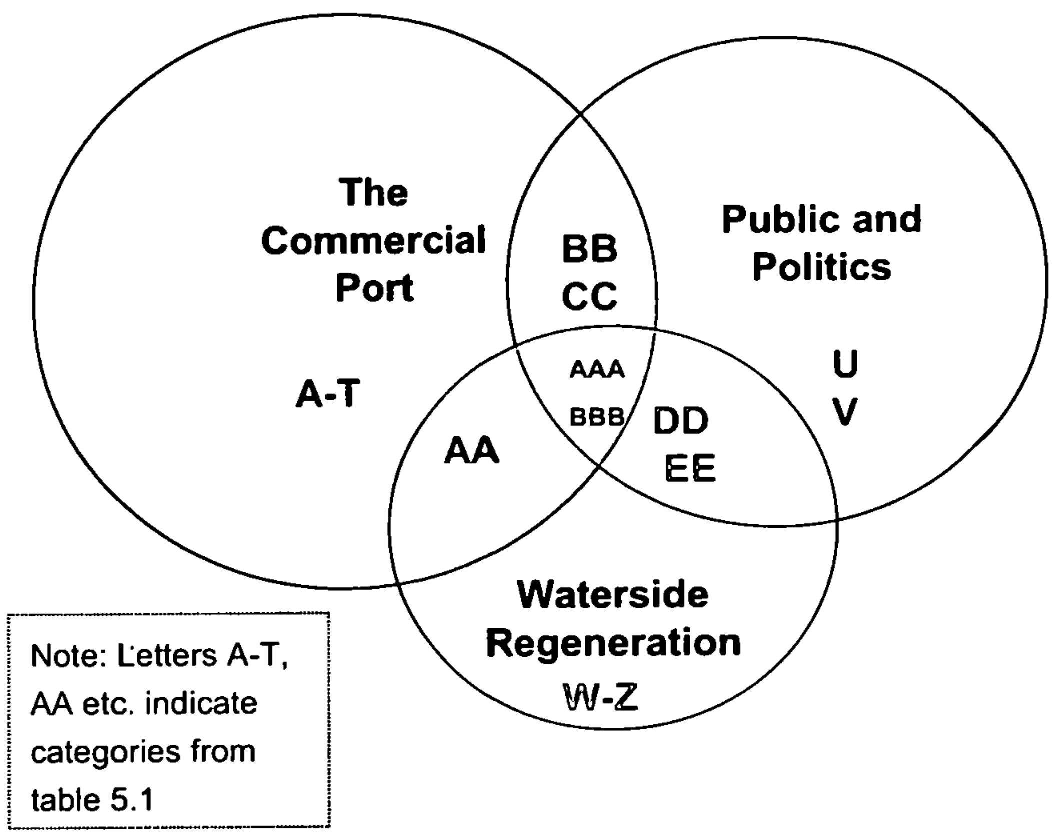


Figure 5-2 Conceptual Model of a Small port's Social and Economic Interactions

Concepts and linkages			Category
The Commercial Port *The commerce, structure and development plans for the small commercial port*		**Port Production** Data relating to the commercial activities of the port but not to external effects.	**A: Agricultural cargoes** Data relating to the import and export of cargoes that are inputs to and products of the agricultural sector.
			B: Clay Cargoes Data relating to the export of china clay.
			C: Stone cargoes Data relating to the export of stone from quarries.
			D: Other cargoes Data relating to cargoes other than stone, clay and agricultural cargoes.
			E: Core cargoes Data relating to cargoes that form a core part of a port's business.
			F: Commercial activities at the port Data relating to the nature and extent of commercial activities (non-cargo) at a port, other than value-added.
			G: Value-added port activities Data relating to gaining additional value from cargoes through processing, mixing, storing and monitoring them.
			H: Marketing Data relating to the promotion of the port to shippers and their customers.
			I: Supply Chain Data relating to the concept of the ship as one link in a through chain of supply.
			J: Competition Data relating to competition between the port and other modes, competition between ports locally and nationally and competitive behaviour by the port to attract new business.
			K: Port pricing Data related to the setting of port charges.
		Internal and external factors Data relating to internal factors of production and changes in the external environment that affect the commercial activities of the port	**L: Land and storage** Data relating to port land, storage and infrastructure.
			M: Inland transport links Data concerning road and rail linkages with the port and its hinterland.
			N: Harbour Data relating to the shelter of the natural harbour and maintenance and repair of dock structures but not to dredging activities.
			O: Dredging Data relating to costs and procedures involved in maintaining water depth within the harbour and approaches.
			P: Ship size Data relating to the multiple issues surrounding the length and draft of ships entering or wishing to enter the port
			Q: Port labour Data relating to dock workers
			R: Management and ownership Data relating to the ownership and management structure of the port and the attitudes of the port owner and/or manager

Table 5-1 Final Ordering of Concepts and Categories **(continued on next page)**

Concepts and linkages			Category
			AA: External environment Data relating to changes that are external to the port and that have a commercial effect on the port.
			AAA: Environmental concerns Issues relating to the environmental impact of the working port.
		Port Development Plans Data relating to the planning and carrying out of changes to the port's infrastructure and superstructure	**S: Development plans** Data relating to past and present plans to develop the port
			T: Development funding Data relating to the financing of infrastructure and superstructure developments
	Public and politics		**BB: Harbour revision order for port development** Data relating to the granting of a harbour revision order for development of the port
			BBB: Local politics Data relating to the interactions between the port and the local political structures
			CC: Public perceptions – not environmental Data relating to the perceptions and feelings of the general public towards the port town, port activities and waterside land
			U: Employment and economic generator effect of the port Data relating to the primary and secondary employment generated by the working port
			V: Regional context Data relating to the politics and planning of ports at a regional level
Waterside Regeneration			**AAA: Environmental concerns** See above
			BBB: Local politics See above
			DD: Stakeholders Data relating to community, business and political organisations and individuals with an interest in the port
			EE: Port closure: public inquiries and planning Data relating to the planning process, including harbour revision orders and public inquiries, concerning port closure.
			W: Port closure: how and why Data relating to the reasons for and immediate aftermath of closure
			X: Port reopening Data relating to the reopening of a dormant port/wharf
			AA: External environment See above
			Y: Port closure: miscellaneous Data relating to the multiple socio-economic issues after a port has ceased trade or closed
			Z: Port closure: the marina Data relating to the conversion into a marina of a port that has been closed to commerce.

Table 5-1 Final Ordering of Concepts and Categories

The following two chapters consist firstly, of the code and theoretical memos that were written during the analytical process, ordered in accordance with the categories from table 5.1. The conceptual diagrams that were drawn during the analytical process are also presented. Secondly, an analysis of secondary data was carried out as the categories emerged. Much of it was generated from 'grey' literature such as unpublished sources or sources only available from the internet. Local newspapers also proved a rich source of information. This analysis from secondary sources is shown in italics for clarity. Finally, the grounded theory analysis was advanced by exploring comparisons likening something within the research to a recognised phenomenon in another field. Some of the literature within that field is examined to help open out the properties of a category and draw connections within the research. This is a common tool of analytic deduction where the fields are related, because what is being done is taking a general theory and *applying* it to a specific area. For example, Porter's (1980, 1985) theory of generic business strategies can be applied to ports with some useful results. However, where the other field is completely unrelated, analogy (the logical inference that if two things agree with one another in some respects they will probably agree in others) is used as a creative tool. It allows the researcher to make a leap to a completely new theory, as for example the ecological theory of small ports.

Chapter 6 The Commercial Port

6.1 Introduction

This chapter and the next contain the full analysis at the categorical level, of primary (interview) data and secondary data from sources such as newspapers, the internet, books and academic journal articles. Each category is defined, then the coding and theoretical memos that were written during the grounded analysis of the interview data are presented as they were written after the various interviews. In some instances, comparisons with other fields are explored as an analytic tool, as explained in the previous chapter. Analysis of the secondary data is then shown in *italics*, for clarity.

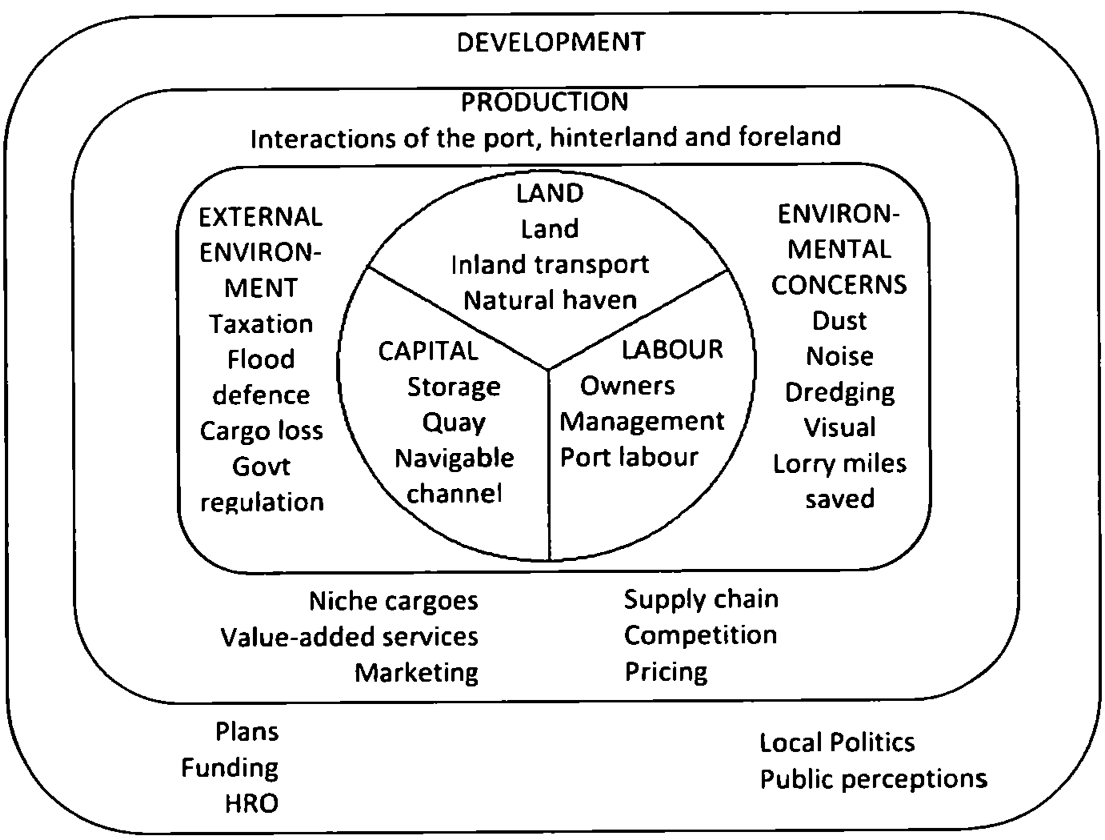


Figure 6-1 The Commercial Port

This chapter explores all the data relating to the commercial port. It is represented at a conceptual level by figure 6.1, which is based on the early ideas shown in figure 5.1 and on later findings.

The next chapter concerns the socio-economics of port closure and waterside regeneration. The concept of 'Public and Politics' overlaps between both these areas. Higher-level analysis, at the level of the three concepts, is completed in chapter eight.

6.2 Primary and Secondary Analysis of Categories Concerning the Commercial Port

6.2.1 Agricultural cargoes

Data related to the import and export of cargoes that are inputs to and products of the agricultural sector.

These cargoes consist of animal feed inputs, fertilisers and grains.

Interview A (Teignmouth port manager): animal feed

"We serve the Devon agribulk market" (Greenwell 2002 p.2). This is a discrete market for Devon. The port is the servant of the market, which suggests a subordinate relationship. What is the market? There appear to be two faces to it, the shipper and the end-user.

The shipper is the direct customer for the port, but the port markets to the end-user through advertising in trade journals, at trade fairs or by showing them round the dock. Their main issue is food safety.

Who is the end-user? "The big animal feed compounders" (Greenwell 2002 p.6).
Shippers: Teignmouth has its 'house' shippers, Reliance, Arkady, ABN and Trident. They compete with Cattedown Wharves' 'house' shipper, Grosvenor Grain. The competition is tough, "the market is so tight" (Greenwell 2002 p.2). What do the shippers do? "They buy it on the Continent, they ship it in, they sell to the customers, sitting behind computer desks in strange towns." (Greenwell 2002 p.6)

The port handles the cargo and re-delivers it to the end-user. This is the *port's* relationship to the end-user: that is, the physical handling of the feed.
Feed regulations post-BSE are intended to keep the feed safe and traceable. The port must demonstrate that it obeys the regulations on traceability, which has had a direct effect on storage. Storage capacity has been reduced by 40% (Greenwell 2002 p.11). On the other hand, the level of the service that the port offers has increased. Safe storage is now essential.

Animal feed theory

Interview A

The relationship between shipper, end-user and port is three-sided, see figure 6.2.
Shippers – a small number of firms, each watching the other. Interdependence is a hallmark of an oligopolistic market structure, but the market is competitive.
Storage – more is needed. It is the basis of profitability. "If I had more shed space I'd do double the business". Greenwell 2002 p.9.

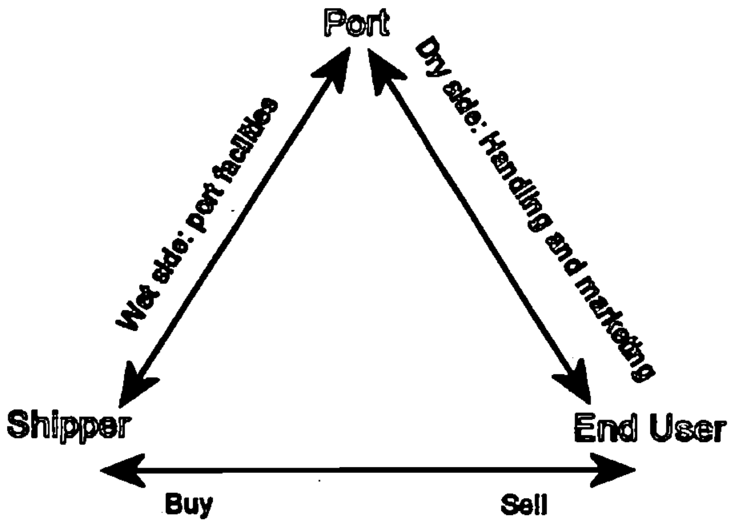


Figure 6-2 Animal feed relationships

Interview B (Plymouth Cattewater harbour master)

This confirms the 'relationship' aspect with the animal feed shippers. Animal feed replaced the loss of cement exports for Cattedown Wharves.

Interview C (Plymouth, Victoria Wharf)

Animal feed involves inter-dependence between shipper and port with a strong relationship between the two sides. Within the small port, small parcel, market segment: geographical advantage provides a monopoly for the port, because margins are not wide enough to pay for additional road-haulage costs from a more distant small port. The competition for the port comes from bigger ports out of the region, handling larger parcels.

Secondary data: Animal Feed Imports

Farm animals are fed on special compound mixtures produced by animal feed millers such as BOCM Pauls, Trident Feeds (ABN) and Dalgety. They buy their bulk raw materials from suppliers such as Archer Daniels Midland, Grosvenor Grain & Feed Co Ltd and Arkady Feed. These raw materials consist of UK grown *wheat, barley and oats and imported grains such as soya and maize, as well as proteins and trace vitamins and minerals (Corporate Watch 1999). France and the Netherlands were the main source for short-sea grain imports in 2005 (Bojkova et al 2005).*

The industry has been under considerable pressure ever since Bovine Spongiform Encephalopathy (BSE) was found to have crossed over from cows into humans as variant Creutzfeld Jacob Disease (vCJD). The infectious agent in BSE and vCJD is a prion, passed on when ingested by the victim. BSE occurred and spread because animal proteins were added to cattle feed. After the BSE scare, consumers then became concerned about genetically modified (GM) foods entering the human food chain directly and through animal feeds. Soya and maize from the USA in particular were cross-contaminated, as GM and non-GM crops were intermingled. There was also a concern about dioxins in the food chain and about salmonella poisoning. More recently there has been concern about intentional contamination of food. These scares, and a general public concern to know the provenance of their food, have led to a demand for the traceability of all elements in the food chain (Von Bailey et al 2002).

The United Kingdom Agricultural Supply Trade Association (UKASTA) represents manufacturers and traders in the UK. Another trade body with an international membership is the Grain and Feed Trade Association (GAFTA). UKASTA and GAFTA operate a registration system for animal feed stores in UK ports. Cattedown Wharves and the Teignmouth Quay Company Ltd both have accredited stores. UKASTA operates a Feed Assurance Scheme (UFAS) with a 'Code of Safe Practice for the Supply and Packaging of Animal Feed Materials which are Destined for Farm Use'. This requires that third party feed stores be *inspected annually or that the stores be registered with the GAFTA/UKASTA storage scheme or the storeowner is a member of the Trade Assurance Scheme for Combinable Crops (TASCC) or is otherwise accredited (UKASTA 2000). The UFAS meets the legal and commercial (supermarket) requirements for animal feed and provides a set of standards based on the principle (widespread in the food industry), of Hazard Analysis Critical Control Points (HACCP, pronounced Hassip). Wessex Grain is a member of TASCC. For both TASCC and the GAFTA/UKASTA Stores Scheme there is a 'Code of Practice for the Storage of Combinable Crops & Dry Animal Feed Materials'. This includes minimum standards for the construction of the store and cleanliness of the store and equipment. To meet the BSE Order 1996, mammalian meat and bone meal must not be on the same site as the feed materials, nor can goods on the Haulage Exclusion List, which includes scrap metal and treated timber. Section F.3.12 requires, "Individual shipments of goods will be stored separately" (UKASTA 2001 p. 4). Ten sets of records must be kept, including the cleaning of stores, handling equipment and protective clothing; testing and sampling; vermin and bird control measures; intake, discharge and stocks of goods; and details of the three previous loads carried by all incoming vehicles (UKASTA 2001).*

It can be seen that compliance with the Codes imposes a cost burden on store owners, increases the storage space that is needed and reduces the flexibility of the storeowner with regard to other materials that can be stored and handled on site. However, compliance is essential if grains and animal feed constituents are to be handled.

The animal feed market in the UK varies with the weather and the stock levels on farms. This is highly sensitive to political and consumer changes. Payments of *farm subsidies have now been decoupled from production levels with the introduction of the single farm payment. Restructuring in agriculture is expected in the UK and Ireland, with fewer farmers and probably fewer animals. This, together with a move to less intensive farming methods with lower inputs of both feed and fertiliser, is expected to have a negative effect on demand. On the positive side, however, full exports of beef and beef products were recently resumed to the EU after a ban was put in place because of BSE in British cattle herds (IAWS Group plc. 2005).*

Secondary data: Fertiliser

Mineral fertiliser consists of nitrate, phosphate and potash, either singly or blended in different proportions. Phosphate is found in North Africa. Germany is the largest supplier of potash (in the form of potassium chloride) in Europe. The UK and Israel are other sources of supply. Urea and ammonium nitrate are sources of nitrate. Urea comes, for instance, from Trinidad but Spain, the UK, Holland and the Black Sea ports are suppliers of ammonium nitrate. Fertiliser is both imported and exported from the UK, in both the bulk, raw state of its constituents and in the final state when it is usually bagged (Tinsley 1991). IAWS Group has a fertiliser blending business with a plant in Plymouth. The farm fertiliser business is sensitive to fluctuations in demand due to energy prices, seasonality, weather and subsidy levels. The horticultural market is expanding (IAWS Group plc. 2005).

Grain

Interview D (Plymouth: Wessex Grain)

There is a close relationship between the port and the customer, "The ports that Wessex Grain mainly use are Plymouth and Poole in Dorset" (Clegg 2004 p. 2). They export to the Atlantic Arc countries of Ireland, Spain and Portugal but not

France, presumably because France is a large producer of grain.

Wessex grain is a farmer's co-operative that exports surplus feed barley and oats out of Plymouth, direct from farms in Devon and Cornwall. It is stored in two 1,000 ton storage silos (built in the 1980s by Tamar Grain), which allows a gradual accumulation of stock that can then be loaded into a ship on arrival.

Wessex sells the grain to shippers who buy at a price set by the EU market and then hold the grain to speculate on the market. The exporters are price-takers in this market so an increase in port dues cannot be passed on, but instead lowers the price paid to farmers, who then release less grain for export. There is no port competition because no other port in the geographical area has the facility of a grain silo. Price dictates throughput, not port choice.

Secondary data: Grain Exports

Barley and Wheat are the principal grains exported from the UK. The great majority are grown in the east of England and Scotland and exported from the East and Southeast coast ports. Facilities have to be built at a port to enable it to accumulate a shipload of grain and then load the ship rapidly. Figure 6.3 shows the facilities at the main ports. These were built during the early 1980s to cater for an increasing surplus of cereal production in the UK, which led to a growing export market that was able to use deep-sea ships. Small ports on the east coast had to build modern facilities, as at King's Lynn, or risk losing much of this trade (Tinsley 1991). In the Southwest of England, Southampton and Portland have grain terminals with 10,000t storage capacity but there are no other large facilities further west. There are small grain silos at Poole, Sharpness and Victoria Wharf in Plymouth (not shown on the figure). Truro applied for planning permission to build a grain silo but this was refused in 2006. There are possibly opportunities for short-sea exports of grain from the far Southwest, which would otherwise have to travel long distances by road to the large export terminals or domestic users.

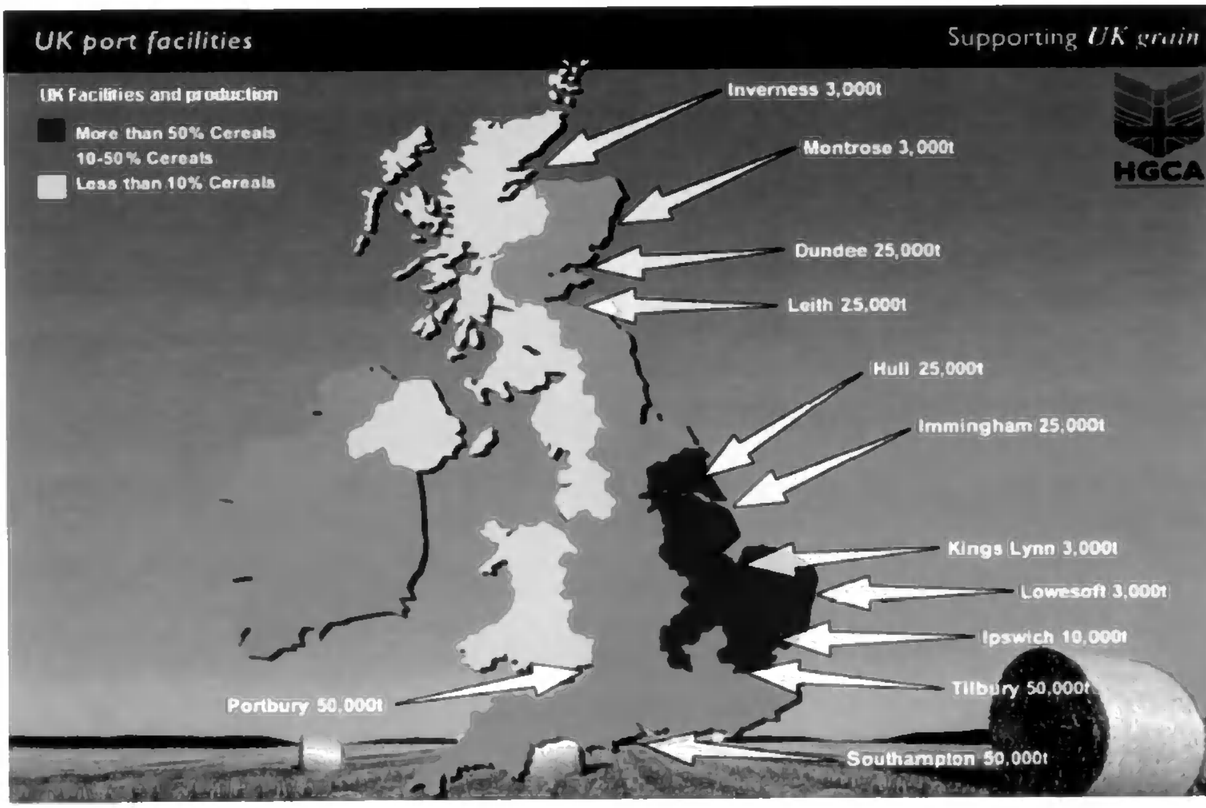


Figure 6-3 UK Grain Production and Port Facilities

Source: HGCA 2006

Wheat is the principal export cargo (figure 6.4) with most going to Spain and Portugal, but it is not generally grown in the southwest. Barley and oats for animal feed are exported through Victoria Wharf to Spain and Portugal, the two largest short-sea markets for grain. In 2005, Grain exports to Spain had been rising since 1998 (Bojkova et al 2005). Truro was hoping to export malting barley. A shipment of 1,200 tonnes of malting barley was put together in 2000 for export to Bremen on the Rhine, but that was loaded directly from lorries on the quayside (Western Morning News 2000a).

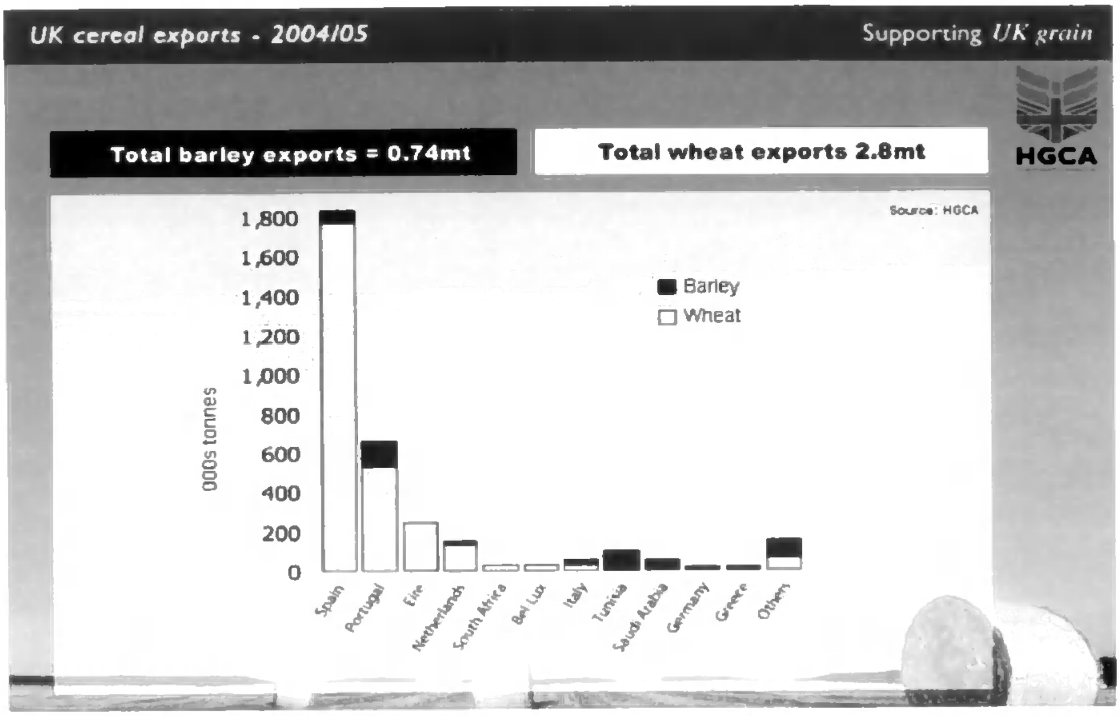


Figure 6-4 Wheat and Barley Exports 2004/2005

Source: HCGA 2006

Summary

This category includes some fertiliser but mainly animal feed cargoes, both imported and exported. Some feeds are imported but surplus low quality grain is exported, increasing the farm gate price. Animal feed is a low margin, traded commodity with stringent traceability requirements. This means that correct storage and information flows are essential. The shipper is the immediate port customer, but for animal feed imports the port markets to the end-user, the firms that compound different ingredients into specific animal feeds. Agricultural cargoes place ports within the rural economy. A local port with the right infrastructure is able to increase the market size, and thus improve the market price, for farmers. It can also cut costs on imported cargoes. However, handling agricultural cargoes requires capital investment in land and infrastructure for covered storage, grain silos and information technology.

Importing animal feed cargoes can be compared to wholesaling. The wholesale warehouse is a large, covered storage area. Goods come in bulk deliveries and are broken down into smaller units to be sold on. The end-user (the retail customer) does not have a commercial relationship with the wholesaler. The warehouse needs to be in a strategic position for distribution. The differences are that the port does not own the goods but simply handles them for the shipper, and the warehouse does not act as an interface between land and water.

6.2.1.1 The Port as Wholesaler

This section explores the comparison drawn above between a port operator and a wholesaler with reference to some theoretical literature on wholesaling.

The foundation work on the subject, at least in the field of geography and trade, is Vance's book "*The Merchant's World: The Geography of Wholesaling*" (Vance 1970). It is a systemic view of wholesale trade over the course of European settlement of North America. He differentiates retail trade, which began as the face-to-face transaction between producer and customer, from wholesale trade, which requires an ***agent of trade***: the wholesaler who holds large quantities and deals with the retailer, not the end customer. That simple description of an 'agent of trade' is applicable to the port operator. It can be said that a port shows some aspects of the wholesaler, but (except where the port operator is also the shipper) most port operators do not buy and sell the cargoes that pass through, they are not merchants or entrepreneurs.

Much of Vance's (1970) book concerns a refutation of Central Place Theory, which was at the time the prevailing orthodoxy for theories of settlement location.

Central Place Theory was created by the German geographer Christaller and published in 1933. He was postulating and then testing an answer to the question: "Are there laws which determine the number, sizes and distribution of towns?" (Christaller 1966 p. 1). He claimed that a 'principle of ordering of places' could not be obtained through historical analysis but required *deductive* reasoning from the disciplines of economics and geography. Christaller concluded that, "The number of types of central goods which are offered at a central place, in addition to other factors such as the quantities sold, the prices set and the like, is a functional influence on the size and the importance of the respective central place" (Christaller 1966 p. 64).

Vance saw Christaller's theory as a special theory of settlement arising from feudal conditions and based on retail trade. In direct contrast with Christaller, he sought to examine the historical evidence to help him create an *inductive* theory of wholesale trade in the New World. He called wholesale trade "the bicep of exchange, connecting producer and consumer over considerable geographical distances" (Vance 1970 p. 8.). To the modern eye, that has similarities to a description of the supply chain. Furthermore, Vance claimed that wholesaling depends on a geographical separation of production and ultimate sale: in other words (but not those of Vance); it needs the intermediation of transport.

After an historical survey of the wholesale development of North America, Vance developed "The Mercantile Model of Settlement as the Paradigm for Wholesale Trade" (Vance 1970 p. 148). This was a model of a mechanism to explain the location of coastal and inland places of importance (figure 6.5). It begins with the gathering of intelligence about the New World. With the 'impulse to trade' comes the harvesting of natural resources from North America, leading to points of

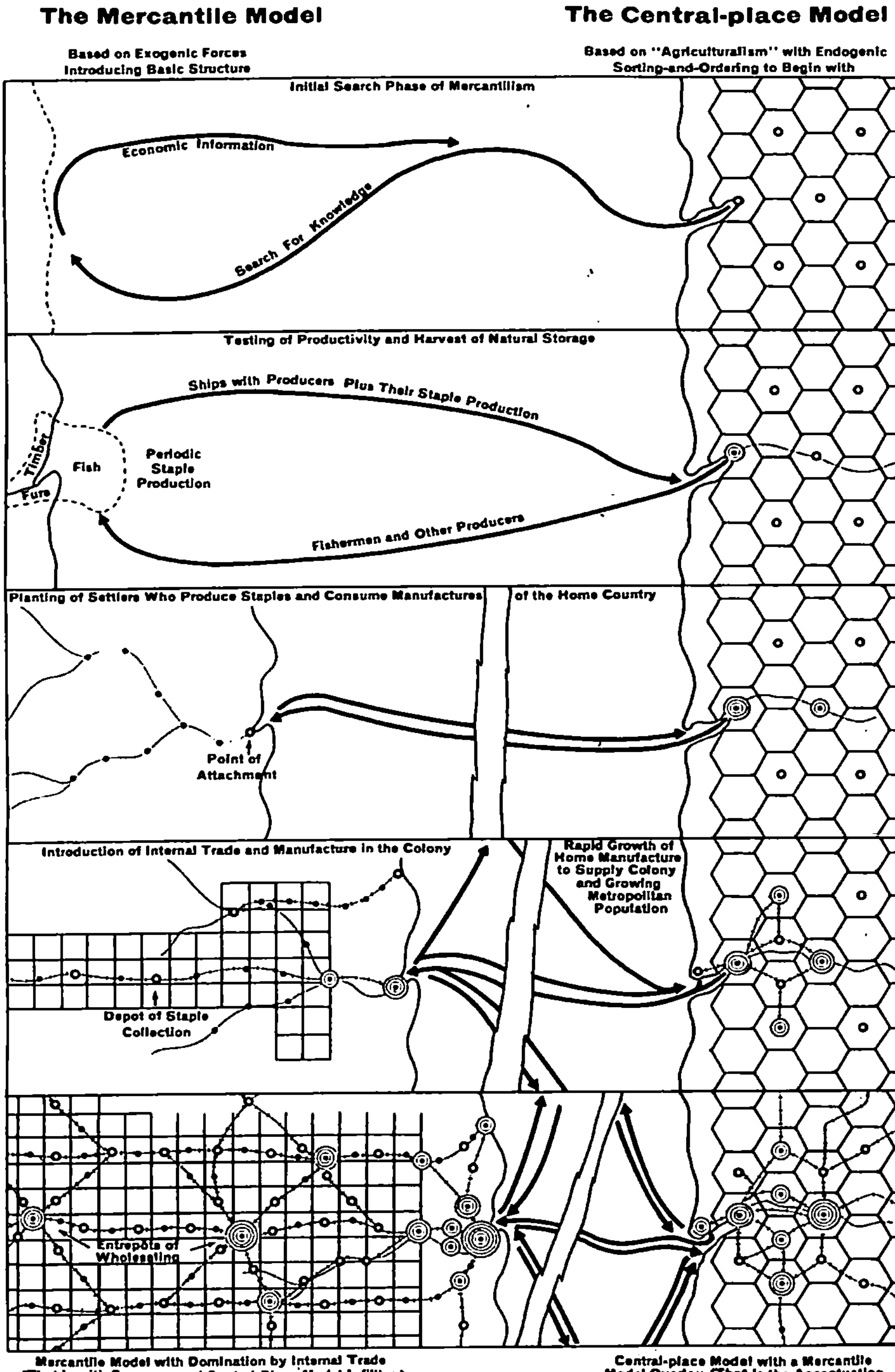


Figure 6-5 The Mercantile Model of Settlement as a Paradigm for Wholesale Trade

Source: Vance 1970 p. 151

attachment: the planting of settlers who start to move inland while exchanging raw commodities and native products for manufactured goods from Europe. These earliest points of attachment have today become the great cities of the eastern seaboard of North America, but not all early ports became cities. The seventeenth century merchants tried many places and then began to concentrate on those with the best lines of communication to internal depots of collection and distribution. Successful cities built canals (such as the Erie canal from New York) and railways to connect the port with the trading hinterland. In the fourth stage of the model there is increased penetration of the hinterland coupled with early manufacturing industries. In the meantime, Europe is experiencing the industrial revolution and urbanisation. The final stage of the model shows a mature industrial system in Europe and industrialisation and internal trade in North America (heavily protected by tariff barriers). By stages four and five, although the old links with Europe remain dominant, both Europe and North America have developed maritime links north and south as well as east and west.

By considering the port as a wholesale agent, Vance's theory of location can be adapted to explain the location of the successful port. The key lies in the operation of exogenic forces: external to the local system of trade and powered by the impulse to trade. A port is made important by the backward and forward linkages (via transport and open trade) that connect it to entrepôts of wholesaling. Vance also makes the observation that centres of wholesaling are created by historical conditions but maintained by tradition, although the system is dynamic and changes in present conditions will modify the framework of the past (Vance 1970).

Although the connection between the Vance (1970) wholesaling theory and port development was discovered independently through the research, it is not new.

Rimmer (1977) draws on both Taffe *et al* (1963) and Vance (1970) to create his model of the "Schematic changes in transport networks at different phases of the process of colonization" (Rimmer 1977 p. 134). These models relate to countries under colonial conditions and so may have little relevance to modern Southwest England (Hoyle and Smith 1998), but more work could be done to develop theoretical models that link modern port development with wholesaling and modern supply chains.

6.2.2 Clay cargoes

Data relating to the export of china clay.

Interview A (Teignmouth)

This is the primary cargo: a secure customer. Teignmouth will refuse other cargoes, such as scrap, if they conflict with clay. Watts Bearn and Baker (known as WBB Minerals) at Bovey Clay Basin and Teignmouth port are interdependent, "We've got to look after each other and we do" (Greenwell 2002 p.10). There are conflicting comments on the need to acquire more clay business:

"I don't chase around clay, because we've got the market cornered." (Greenwell 2002 p.6). This refers to the core business from the Bovey Clay Basin.

"There is always more of the [clay] business I could have" (Greenwell 2002 p.10). This refers to business from other pits at Plymouth and North Devon. It appears that Teignmouth is active in trying to secure more clay business from WBB Minerals and Imrys. Shippers gain keener pricing and better service by having a choice of ports.

Interview B (Plymouth Cattewater harbour master)

A claim that Cattedown Wharves have taken some clay business from

Teignmouth. This confirms the element of inter-port competition over clay. It is more overtly competitive than the animal feed business.

Interview C (Plymouth Victoria Wharf, dock manager)

Clay is intensely competitive between small ports except where the geographical connection is very strong. Where parcel size is constrained by the size of the discharge port, the option of trucking clay to large ships in larger ports in the South East does not exist. As china clay is a higher value cargo than animal feed, it is economically feasible to truck it to different ports within the region, thus keeping prices down through port competition.

Secondary data: China Clay

Clay exports from Southwest England consist of china clay (also known as kaolin), which is exported from Cornwall and Devon, and ball clay, which is exported from Devon and Dorset.

China Clay

China clay is a soft, white plastic clay of the mineral kaolinite, which was formed from some types of granite, either through weathering or by the action of steam during the cooling process (hydrothermal alteration) when the igneous rock was formed (Murray 2002) . Primary deposits of china clay are found where they were formed. Weathering causes shallow deposits of clay such as that found in the Czech Republic, France, Spain, the Ukraine and the USA. Elsewhere in Europe, Turkey, Mexico and Iceland, the volcanic granite was attacked by sulphurous steam as it cooled, forming deep deposits of china clay. The clay deposits in Southwest England are unique because they were made from molten granite pushed up by the collision of continental plates. This granite forms the spine of the

Southwestern peninsula. As it cooled, it was attacked by steam and mineral vapours to form large, funnel shaped deposits of very pure, white clay that is ideal for making ceramics and paper. There are no other china clay deposits in the UK (World Mineral Exchange 2005).

Elsewhere in the world, there are secondary deposits of china clay caused by sedimentary deposition. Those in Georgia and South Carolina in the USA and in the lower Amazon basin in Brazil are the most important. Like the primary deposits in England, they are very white and pure which makes them suitable for paper coating (Murray 2002).

China clay is found in Cornwall at Land's End, the St. Austell moors and on Bodmin moor, and on the southern fringe of Dartmoor in Devon. Only the St Austell and Dartmoor deposits are now worked. The deposits in Cornwall were discovered by William Cookworthy, an apothecary, in 1746, and originally used to make whiteware ceramics. Although about a third of production is still used in this way, by the early twentieth century papermaking had become the main use for English china clay (paper filling and paper coating) in addition to a range of other uses including paints, dyes and pharmaceuticals (World Mineral Exchange 2005). The Southwest of England was the world's second largest producer and exporter of china clay after the USA (British Geological Society 2006a).

After a period of consolidation and takeovers, the china clay industry in Devon and Cornwall is now controlled by three firms. The largest used to be English China Clays (ECC) but in 1999 this was bought by a French firm, Imerys Minerals Ltd, a subsidiary of Imerys Group of France, for £756 million (Press Association 2006). Imerys is the world's largest producer of china clay with operations in the USA and

Brazil. Imerys has quarries at St. Austell and at Lee Moor on Dartmoor. It owns the china clay ports of Par and Fowey and exports mainly through them. WBB Minerals Ltd operates only in Devon with two pits. It is owned by SCR Sibelco of Belgium. Goonvean is a privately owned company with five operations all at St. Austell. (British Geological Society 2006a). It ships out through Victoria Wharf in Plymouth using a dedicated lorry fleet. (Goonvean 2006)

China clay is extracted by blasting high-pressure jets of water at the pit face. The slurry drains down to the bottom of the pit and is pumped out to be refined and dried in an energy-intensive process. Some clay is exported in slurry form, some is bagged but most is transported in bulk. Over 80% is exported although some china clay is used in the UK ceramics industry. A considerable amount of sand and rock waste is produced by the extraction process and finding tipping space is an issue for the industry. Some waste is processed and sold as secondary aggregates (British Geological Society 2006a). Some dry mining also takes place, notably at Lee Moor on Dartmoor.

China clay has considerable economic importance both locally and nationally. Imerys was the largest private employer in Cornwall with a workforce of over 2,500 until recently and an estimated arrival value of £120 million pounds to the Cornish economy (World Mineral Exchange 2005). Domestic sales are transported by road to Staffordshire where they support the whiteware ceramics industry employing 16,500 people. In 2004, 89% of production was exported with a value of £173 million, providing a significant contribution to the UK balance of payments (British Geological Society 2006a). The main market is in Western Europe, especially the Nordic countries. It is highly competitive and exports from the Southwest face a number of problems, including competition by calcium carbonates for the paper *filling market, competition from the USA (but the sedimentary deposits are becoming worked out), and severe competition from Brazil. The primary deposits in the Southwest are becoming deeper and narrower as mining progresses. The climate change levy, imposed in 2001, increased energy prices in the UK but not the USA. Finally, recent worldwide increases in energy prices have badly affected profitability in an energy-intensive industry (British Geological Society 2006a, World Mineral Exchange 2005).*

Imerys have been cutting staff at their pits in Cornwall and Devon since 2004 when about 400 people were made redundant. In 2005 there were further job cuts as profits came under pressure. In March 2006, 130 jobs went and then in July 2006 Imerys announced the loss of 800 jobs (nearly half the remaining workforce), the closure of its mining, refining and drying operations in Devon at Lee Moor and the ending of paper coating exports from Cornwall. All paper coating production in future would be concentrated in Brazil. The reasons given were high energy prices, a weak dollar and overseas competition (BBC News 2006a, 2006b).

The effect of production cuts at Imerys will be felt most keenly at Par and Fowey, the company ports. Although Par is the smallest port it was considered essential to operations, being linked to Fowey so that when weather conditions closed one port, a ship could be directed to the other to receive its cargo (Tinsley 1984, 1991). Imerys and Cornwall County Council have invested in work to lower the roadbed of an access road to the port that passes under a rail bridge, thus allowing lorries to reach the port of Par without passing through St. Blazey and Par village. However, Devon County Council paid to improve the road access to Exmouth port just before that closed. There is a strong possibility of closure for Par. Goonvean supplies china clay for ceramics and pharmaceutical use, not paper coating, and *has not declared redundancies. It is the principal customer for Victoria Wharf. Teignmouth is secure in its relationship with WBB. Both ports may expect to lose some trade from Imerys but not their core business.*

Ball Clay

Ball clay (also known as pipe clay and plastic clay), is formed from sedimentary deposits of kaolinite, mica and quartz. They are used almost entirely in the ceramic whiteware industry, especially sanitary ware. Deposits vary in their make-up but those found in Southwest England are of very high quality with a wide range of types. They are found in only three places, the Bovey Basin in south Devon, the Petrockstowe Basin in north Devon and the Wareham Basin in Dorset. Imerys did produce ball clay from all three areas but closed operations at Petrockstowe in 2004. WBB is the only other producer of ball clay in the area and the largest, both locally and in the world. It only produces in Devon (Echlin 2001).

Like china clay, ball clay is worked in open pits. It used to be cut out in cubes that became rounded with handling, hence the name. Today it is excavated along individual seams. The clay is then shredded and blended to produce a final product with the necessary properties required by the manufacturer. The fine particle size makes refining uneconomic. The wide variability of clay seams in Devon and Dorset allows for excellent control of the makeup of the final product, for which manufacturers often require long production runs (British Geological Society 2006b).

Exports accounted for 83% of final sales of ball clay in 2004, worth about £40 million. Most exports go to Spain, Italy and other EU countries but some is exported worldwide. Domestic sales are declining with the decline of UK *manufacturing, but like china clay, ball clay supports the domestic ceramics industry. In Devon and Dorset the ball clay industry employs about 400 people directly with further indirect employment being generated by outsourcing, transport etc (British Geological Society 2006b).*

Imerys export the ball clay from Dorset through Poole harbour. WBB exports some of the clay from north Devon through Bideford, and there is planning permission for Yelland Quay to be developed for ball clay exports. The greatest volumes of exports go through Teignmouth in the south, primarily from WBB but also from Imerys. The clay has to be transported by lorry to the port. Some rail transport exists for domestic sales of ball clay.

6.2.3 Stone cargoes

Data relating to the export of stone from quarries.

Stone is exported from Dean Quarry and Porthoustock, each quarry having an adjacent wharf. They lie within the Falmouth Harbour area but outside the Fowey estuary. The wharves allow the stone to be exported out of the region by low-cost, low-pollution sea transport instead of being trucked on congested roads. The freight rate is low (and the author knows from experience that stone cargoes cascading in to the hold from a chute can damage the tank tops in the hold) so some ship owners refuse to take stone cargoes. However, the quarries are strategically placed on the sea-lanes so that stone is a useful positioning cargo. "A lot of ships discharge in Ireland or the west coast and then on their way back to the east coast or to Rotterdam they pick up a positioning cargo … it just pays the crew's wages and the fuel bill probably" (Kent 2005 p. 7).

The stone wharves are exposed to the weather, shallow at low water and with a rocky bottom. Ships berth for three hours over the high tide and keep the engines running against the forward springs (ropes leading aft from the bow). They are loaded from chutes and move forward under the chutes during the loading process so that the stone is spread through the hold. The wharves only exist to serve the quarry and when the quarry is closed, the wharf is closed. However, Porthoustock was closed and then re-opened by a new owner who was able to invest in the facilities. The wharves make the quarries economically viable.

Secondary data: Stone Cargoes

The stone trade consists of primary and secondary aggregates and reclaimed material. Primary aggregates are quarried or dredged materials, principally crushed granite, limestone, basalt, sand and gravel (Tinsley 1984). Secondary aggregates are produced as a by-product of other quarrying and mining activities such as the production of china clay. Reclaimed material includes crushed building material from demolitions and slag from steel making. Aggregates are used in civil engineering projects, road making and repairs, building work, rail ballast and small specialist uses such as steel and glass making.

The main market for stone is in London and the Southeast. This area has the highest demand for road and building development but no source of granite. Stone is imported from Scotland, Ireland (which has an important quarry at Arklow), Wales and Southwest England. Stone is a very low value bulk commodity that is ideally suited to transportation by sea. Freight rates are low but cargoes can be picked up on the backhaul, making the round voyage more profitable. Loading jetties tend to be tidal and capable of handling only small ships (Tinsley 1984). The *exception is the use of handy-size self-unloading bulk carriers to bring stone from Scotland to the Thames.*

An aggregates levy came into force in 2002 at a rate of £1.60 per ton. This was intended to stimulate the use of secondary aggregates. The china clay and ball clay quarries in the Southwest have been active in seeking a market for the by-products of clay production. One problem is reported to be a shortage of available small ships for the facilities at Par (British Geological Survey 2006a).

6.2.4 Other cargoes

Data relating to cargoes other than stone, clay and agricultural cargoes.

Interview A (Teignmouth port manager)

Other cargoes are a poor third behind clay and animal feed. They will only be accepted if there is no conflict with the primary cargoes. Space restricts timber imports. Teignmouth would like to find a 'niche' cargo such as stone or salt.

Interview C (Plymouth Victoria Wharf, dock manager)

Animal feed and china clay are the most important, bread-and-butter cargoes. Other cargoes are the jam but they can only be taken if there is the storage space and if the cargoes are available.

Aggregates – sometimes handled in Truro.

Calcified seaweed – 20,000 tonnes a year of maerl or calcified seaweed was dredged in Falmouth harbour and landed at Truro for processing. Some of it was then exported. This was the core cargo for Truro for 27 years. It stopped on January 1st 2005 because the dredging licence was withdrawn.

Secondary data: Calcified Seaweed

Calcified seaweed or maerl (not to be confused with the soil marl, which is also used as a fertiliser) is made from detached coralline algae. It is found in sub tidal deposits on the coasts of Brittany and Southern Ireland as well as at Falmouth on St. Mawes Bank. Some deposits consist of dead coral, as at Bantry Bay, but the deposits at St. Mawes Bank consist of live maerl and dead deposits. This is a renewable source, although at a slow rate. The pink live maerl in Falmouth is the largest area in the waters of England and Wales and it shelters a rich diversity of plants and animals. The dead marl is also a rich habitat, which is why the dredging licence was withdrawn (Carrick District Council 2004, Guiry 1997).

Maerl is chemically similar to limestone but with added trace elements. It is dried and ground up, then sold as a premium soil conditioner and top dressing, especially for horse paddocks and organic grassland, and commands a price well above ordinary limestone dressings. In addition, it is used in horticulture and as a filtration agent for water purification. Loss of the dredging licence in Falmouth led to the loss of this resource for the rural community of Devon and Cornwall, loss of the income it brought locally, loss of nine jobs at the Cornish Calcified Seaweed Company and loss of the stevedoring company they ran. The port of Truro, which enables sustainable sea transport to the heart of Cornwall, lost revenues and its only stevedores, putting the port under severe strain (Wallingford 2003, Guiry 1997).

Cement – this used to be a core cargo from Cattedown Wharves in Plymouth until the cement factory closed down. There are plans to import cement to Plymouth at Pomphlett jetty. Cement is now the main cargo at Truro. Imports have doubled from 15,000 tonnes to 30,000 tonnes since the loss of the calcified seaweed.

Secondary data: Cement

Bulk cement is imported into Truro on the Cementina, a 'cement-tanker' that has its own discharging equipment, see figure 6.6.

Figure 6-6 The Cementina

Source: Terje Moen , 23rd Nov 2002,Tananger

The loading and discharging is by a closed system that reduces dust. The Cementina flies the Comoros flag, of 1096gt and she was built in 1960. In 2003 she was converted in Riga shipyard, increasing her size from 899gt to 1096gt by being lengthened with 2 hull inserts 7.5 and 4.5 meters in length as well a lot of steel, piping, painting and machinery works (Riga Shipyard 2006). She is presently trading out of Bremen in Germany for Truro (Truro Packet 2006). The demand for cement depends on the state of the economy and the construction industry. With *the availability of extra space at Truro, the current importer has decided to double his cement imports from 15,000t a year to 30,000t a year, building the storage himself. The availability of aggregate from Dean Quarry and Porthoustock together with cement storage, make Truro an excellent site for producing concrete. It is hoped that concrete blocks can be made at the quay and exported to the southeast.*

General cargoes – Watchet handled general cargoes and containers. The quay was strengthened to take container loads. Cargoes included steel from Spain, cork from Portugal, wine and packaged timber. Exports included cars, waste paper and some feed cake. Dredged sand was landed for a time but that was unpopular. There were few bulk cargoes that were unloaded by grab into lorries. General cargoes and containers are more acceptable to local people because they do not create dust and noise. Truro also takes general cargoes, bagged and palletised, as well as bulk cargoes.

Secondary data: General Cargoes

Modern distribution of general cargoes is by unitised multimodal transport. There are no ports able to handle containers west of Portland and Portbury. There are three reasons for this: lack of demand due to a lack of industry in the West Country, lack of political will and co-ordinated planning policies to build a feeder terminal capable of stimulating local industry, and the ferry terminal at Plymouth Millbay that handles driver-accompanied vehicles and some unaccompanied vehicles on the Plymouth-Roscoff and Plymouth-Santander routes. From Plymouth, cargoes can be distributed throughout the peninsula and north to the M5 and the Midlands.

Scrap metal – The china clay ports do not handle this, nor did Watchet. Exmouth handled scrap and Truro exports it to Spain. It is stockpiled in the open air and local residents dislike both the visual impact and the noise. In Truro, the port operates under a noise abatement order and can only handle the scrap metal within certain times.

Secondary data: Scrap Metal

Scrap metal is a minor constituent in the making of steel by the basic oxygen furnace, but it is the primary feedstock for electric arc furnaces. These are growing rapidly in number in the developing world. Northern Spain also has electric arc furnaces and there is a long-established trade in scrap from the UK to Spain (Tinsley 1984, 1991, Packard 2004). During much of the 1990s and early into the twenty-first century, there was world over-capacity in steel production. This led to substantial re-structuring especially in Europe, with a consequent fall in demand for scrap. Since 2002, fuelled by economic growth in China and India, demand for steel has risen and with it the price of iron ore and ferrous scrap.

The UK is an important producer of scrap and demand for this cargo should remain high for the foreseeable future, especially in light of the high price of energy and the interest in recycling. If waste incinerators are built in Cornwall (this is the subject of fierce political debate in the local press), then a by-product of incineration is municipal shredded scrap, another potential cargo (Packard 2004).

Scrap is an unpopular cargo with a port's neighbours. It must be left to cool and weather in unsightly piles to reduce the risk of fire in a ship's hold, see figure 6.7. It is also normally loaded, after an initial layer has been placed on the tank tops, by dropping the scrap into the hold from hatch height. This is noisy (Packard 2004).

Truro handles 50,000 tonnes a year of scrap metal, which used to travel by lorry to a port over 200 miles away. Use of the facility at Truro has reduced annual lorry mileage from 200,000 miles to 10,000 miles (HR Wallingford Ltd. 2003).

Figure 6-7 Scrap metal weathering by Lighterage Quay, Truro

Source: The Author

Timber – Both Watchet and Truro imported packaged timber for making pallets. Teignmouth handles some timber and would like to do more. This is a clean cargo but it requires storage space.

Secondary data: Timber

Teignmouth handles some timber but lacks the space for more. There is a strong demand from shippers to bring it in. Watchet imported timber from Portugal for pallet making, as did Truro. Truro lost the trade to Par because of some very competitive behaviour. Forest products are the largest dry bulk group of imports, by tonnage, to the UK in the short-sea trades (Bojkova et al 2005) and the UK is a large net importer of forestry products. Sweden, countries of the former USSR and

Canada are the largest suppliers (Southwest ports are badly placed or too small for these shipments), but Spain, Portugal and Ireland also export forest products to the UK. There are undoubtedly possibilities in this market if the storage space could be found. The problem reported by the harbour master of Truro is that modern short-sea ships bring in loads that are too large for local distribution but too small to compete against the combination of large east coast ports and road distribution.

6.2.5 Core cargoes

Data relating to cargoes that form a core part of a port's business.

At Teignmouth, the core cargo is china clay from WBB Minerals in the Bovey Clay Basin, followed by animal feeds. At Victoria Wharf it is china clay from Goonvean in Cornwall. At Cattedown Wharves it is animal feed, which has replaced cement cargoes. Cattedown Wharves also handle bulk liquid petroleum. At Truro it was calcified seaweed and is now cement. Waste paper was probably the core cargo at Watchet, although originally it had been iron ore. At Exeter it was animal feedstuffs. At Porthoustock and Dean Quarry, the sole cargo is stone.

Core cargoes - theory

Loss of a sole cargo leads to closure of a port or wharf. Loss of a core cargo is both a threat and an opportunity. It threatens the viability of the port and may lead to job losses, but an active port manager with the right institutional structures and some financial leeway can find replacement cargoes. The core cargo has to be protected which restricts the possibilities of diversification. Loss of the core cargo frees up land and facilities for new possibilities.

6.2.6 Commercial activities at the port

Data relating to the nature and extent of commercial activities (non-cargo) at a port.

Interview H (Watchet harbour master)

Watchet was unusual among small ports because it handled containers and general cargoes. There was very little grab work (bulk cargoes). The East wharf had been strengthened to take the weight of full containers (Cattedown Wharves in Plymouth, for example, is not strong enough for that). The port had cranes and one shed as well as considerable land for storage. It employed 24 docker workers. After Watchet Marine became insolvent in 1993, the port generated some income from rig lay-ups, some passenger trips and landing dredged sand.

Interview N (Truro harbour master)

Commercial activities consist of both cargo activity and other sources of income. Truro is fortunate because it owns the riverbed down to the Falmouth harbour limits. Because of that, the harbour can make money from commercial shipping, fishing, leisure moorings, a pleasure pier, park and water ride pier, aquaculture and lay-up berths for very large ships. Few ports are so fortunate or far-sighted but it is important to 'think outside the box' and maximise every possible source of income.

6.2.7 Value-added port activities

Data relating to gaining additional value from cargoes through processing, mixing, storing and monitoring them.

Value-added services are mainly the collection and storage of bulk cargoes prior to export, storage and recording of cargoes as they are broken down after import, the tracing of animal feed cargoes, and cargo mixing where inputs are brought from various sources, mixed and then exported or trucked inland. More land and investment would allow for more value-added services including assembly or manufacture. It would also keep bulky freight off the roads.

6.2.8 Marketing

Data relating to the promotion of the port to shippers and their customers.

Interview A (Teignmouth port operator)

Shippers book cargoes one ship at a time. Cold calling of shippers is not useful "they all know where we are." Customers are aware of the ports and what they can offer, but "we make it [*port services*] known to them." This is done by advertising in trade journals or at trade fairs and by direct contact with industry groups.

Interview N (Truro harbour master)

This confirms that only limited marketing is affordable and practicable. Adverts are put into trade journals. Truro also has a comprehensive web site: a good web page is a necessity for small businesses today. Potential customers are visited to establish their precise needs.

Small ports specialise in particular *niche cargoes.* Their strength lies in their geographical position and the level of service that they can offer. This is marketed to potential customers within the niche and by establishing personal relationships. *See section 5.3.10.1 for a development of this idea.*

6.2.9 Supply chain

Data relating to the concept of the ship as one link in a through chain of supply.

Interview A (Teignmouth port manager)

The commodity is moved along the cheapest route for its parcel size, place of origin and place of destination. Teignmouth is working within the small ship segment of the supply chain, "it's more to do with where it's going and how they want to ship it" (Greenwell 2002 p.8). The port cannot compete with big shiploads from South America coming by road from Southampton. Within the small port market, road costs are crucial to margins (Greenwell 2002 p.8). The cost of handling between here and Plymouth is greater than any cost advantage between us." This provides the geographical advantage of the port. Outside the small port market, economies of scale for big shiploads make long road haulages from big ports economic.

Interview N (Truro harbour master)

Importers and exporters of cargo seek the cheapest route end to end for their goods. Frequently, that means putting the goods on a lorry to a port halfway across the country. However, for small parcels moving between the Southwest and Spain and Portugal, or the Southwest and Norway for example, the use of small ships and small ports is the most economical way to move goods. Sometimes it is the only economic way to move goods so that some markets and trades are dependent on the continued existence of a port with the right facilities and in the right position.

Secondary data: the Parcel Size Distribution Function

Stopford (1997) describes a parcel as "an individual consignment of cargo for shipment" (Stopford 1997 p. 13). The term is taken from the products and chemical tanker trades. The economics of transport, storage and demand dictate the parcel size for each shipment. Although these can vary widely, for any one commodity there will be a typical range of sizes and a typical modal size. Parcel *sizes fall into two distinct categories; the big parcels of bulk cargo carried in a full shipload, or in a full hold or tank, where the whole ship has been chartered by a single shipper, and the small parcels carried on liner shipping. In the bulk cargo category, there lie a number of divisions by size of ship. Within each trade (dry bulk and wet bulk) ships are placed into size categories by market traders, such as pannamax or cape size for dry bulk, or suezmax or aframax for wet bulk. Each size category exhibits distinctive market behaviour (Kavussanos and Visvikis 2006), dictated by the trade routes and demand characteristics of the typical commodities carried within that size segment.*

6.2.10 Competition

Data relating to competition between the port and other modes, competition between ports locally and nationally, and competitive behaviour by the port to attract new business.

Interview A (Teignmouth port manager): Geography

The geographical position places Teignmouth only five miles from the Bovey Clay Basin. It is strategically positioned between Weymouth and Plymouth. It is a south coast port, so ships coming from the Continent have no need to sail round to the north. Finally, there is the position in relation to inland cargo generation. Road links are important and Teignmouth can feed north, east or west into Devon.

Interview A (Teignmouth port manager): competition

Teignmouth competes with Plymouth, Erith, Southampton, Bideford and Felixstowe. How does it survive when the larger ports encroach on its hinterland?

Interview B (Plymouth Cattewater harbour master)

This confirms much that was said in the first interview. Cattedown Wharves and Victoria Wharf have "created a lot of business" by "being competitive", they "give the customer what he wants". Customer service is therefore important but also, "deal making" and being "quite aggressive." Cattedown have increased their throughput of clay and agribulks.

Competition and ship size: theory

Interview M (Porthoustock, Dean Quarry and Truro, chief pilot)

The competitive advantage of a small port is to be in the right place with the right facilities (mainly storage) to handle cargo. Small ports cannot compete with large ports except where the shipper wants no more than a small parcel size: less than 3,500 tons. The demand for small parcels of bulk cargoes exists. The problem lies with the diminishing numbers and lack of economic viability of small ships, and with the closure of foreland ports, which breaks the supply chain.

Using a theoretical comparison (see section 4.8.4), competition between ports can be compared with competition between plants. In both cases there are vigorous and weak species and yet diversity is maintained. Why don't strong plants take over the habitat of weak plants? Why don't large ports take over the entire hinterland of small ports?

6.2.10.1 Port Competition

Plant communities consist of a mixture of species, some of which are more successful than other species. The species compete for resources of light, water and nutrients. The success of a species can be measured in terms of productivity, biomass or coverage (Whittaker 1965). This has some similarity to ports, some of which are more successful than other ports. They compete for cargoes and development resources: their success can be measured in terms of productivity, tonnage and hinterland reach (the hinterland is the land area behind a port that generates cargoes for that port). A community of plants consists of a few that are dominant and affect conditions for all other plants in the area (by providing shade or using up nutrients, for example). Most plants are of intermediate success and a few are rare. The presence of rare plants increases the diversity of a plant community. Diversity is maintained in nature because each plant species is adapted to slightly different requirements of light, soil, space or seasonal times of flowering and fruiting. Thus, in a beech wood the trees are dominant. In summer they overshadow the whole wood, but bluebells co-exist because they are adapted to grow leaves and flower in spring, before beech leaf-cover is developed. A plant's specialisation in this way is called its 'niche'.

"Each species occupies the part of niche space to which it is best adapted – the part in which it has competitive advantage over other species – and each species occupies as large an area, and occupies it as densely, as competition and other limitations permit" (Whittaker 1965 p. 254). Niche differences make plants into partial competitors, not full competitors (Whittaker 1965). This is known as the Lotka-Volterra competition model, a 'classical' model that forms the basis for more recent refinements on the ideas of competition and co-existence. New models show that refuges from competition are important. These are stages in a plant's life, such as the seed stage, when they do not face competition. They also show that in nature there is more than one mechanism operating to create and maintain the balance between competition and co-existence: some models claim that the equilibrium state is co-existence, others that the dominant species is in the process of taking over from lesser species, but that equilibrium is indefinitely slowed down by various mechanisms (Silvertown and Charlesworth 2001, Amarasekare 2003).

Applying this understanding to ports, it explains the survival of diversity in port size and type because each port occupies a niche. The surviving small port has adapted to serve a niche market of dry-bulk trades connected to the rural economy. For example, of Teignmouth, "We are not a port where you could send a container of tyres through. We're a port where you could send 2,000 tonnes of animal feed, fertiliser, stone, salt, coal, something like that" (Greenwell 2002 p. 7). Medium-sized ports serve their own niche: Plymouth Millbay serves the ferry market, Portland serves the bunkering market and Bristol Portbury specialises in automobile imports and overseas dry-bulk shipments. Refuges from competition are important to small ports but they vary in type. Truro did not collapse when the calcified seaweed trade was stopped because it had an income from leisure and riverbed activities, and had retained its own financial reserves instead of paying them out to the General Fund. Watchet had a temporary refuge from the blast of competition caused by a change in the external environment (the ending of the Dock Labour Scheme) because the parent company to the port operator liked the port. It could have given the port time to modernise and find new trade, had funds been retained for investment and the management been more pro-active.

Diversity in plants matters because it maintains diversity in the animal and insect species that depend on them. Diversity in ports matters because they maintain diversity in the economic enterprises that depend on them. Marginal import and export activity will either cease with the closing of a port, if it is a local monopoly in its niche, or transfer to other ports with an increase in transport and environmental costs and a subsequent deadweight loss to society. Finally, just as a plant community is dynamic, with changes to the internal and external environment leading to death, decay and colonisation by new species, so port systems are dynamic with old ports dying or reviving like new growth shooting from an old root, and new ports being created to fill a new niche in the environment.

Animal and insect species have evolved to depend on certain plants, which in turn have evolved to fill a niche in a particular environment. This is mirrored in ports when a shipper specialises in a particular port or ports (Hall 2004). Research has shown that in the automobile importing industry in the USA and in the container trades, individual firms are concentrating on a few ports although there is deconcentration in the port system. Hall (2004) demonstrates that the level of port concentration, and the choice of ports, is a function of the particular strategies adopted by each importer and of their interaction with the strategies of the port. He points to the importance, in understanding the geography of world port systems, of an understanding of the variations in individual firm and port strategies. Study of the small port reveals these relationships, interdependencies and mutual specialisations most clearly, but like so much that has been discovered, they may also apply to the wider port community.

Niche Marketing

If a small port survives by occupying a niche in the wider port environment, it follows that it will use niche marketing to increase business. This has already been remarked on in the port marketing category. Looking at the literature of niche marketing or concentrated marketing, this is recommended when company resources are limited. The firm acquires a strong market position in the niche through knowledge of the customer base and through fine-tuning its products and services. Within the niche, competitors are few and the firm can focus limited resources in a small area of supply. The firm can use the niche to gain a foothold in a difficult market and then expand when it is strong enough (a strategy employed by several new container ports) or it can stay small and focused. The internet provides a low-cost method for small businesses to reach a niche market: Truro has an excellent web site. Concentrated marketing allows a small business to reap good profits, but the risks are greater because loss of a single customer can put the viability of the whole business at risk. In addition, a large firm with more resources may choose to enter a market with good profits (Armstrong and Kottler 2007).

Secondary data: Competitive Advantage through a Strategy of Focus

Porter (1980, 1985) identifies three generic strategies that can be used by a business to create competitive advantage within an industry. These are cost leadership, broadly targeted differentiation and focus. Focus concentrates the firm's efforts on a particular type of buyer, a particular type of good or service or a specific geographical area. Within a focused strategy the firm can again choose between cost leadership or differentiation. A firm that chooses focus or differentiation as a strategy may have to reduce market share or sales. The choice of strategy is dependent in some respects on the industry served: bulk commodities are entirely cost-based (certainly in dry-bulk shipping), while other industries are more sensitive to quality or specialised knowledge, such as chemical tankers in the wet-bulk shipping market.

6.2.11 Port pricing

Data related to the setting of port charges.

Interview A (Teignmouth port manager)

The competition between other small ports keeps prices keen. The port has some control over prices but this is limited. Close substitutes for the port are neighbouring small ports and large ports farther off. The market model that best fits would appear to be that of monopolistic competition. The proper storage and record keeping of cargoes is "almost as important as price." More shed space brings more business. Teignmouth is very keen to offer good service and has innovated by creating a bespoke computer program to track animal feed cargoes from ship to lorry. The competitive environment demands good service, which drives innovation as a way of differentiating the port. See figure 6.8. Where does cost come in? "The facility you can offer is almost as important as price" (Greenwell 2002 p. 9).

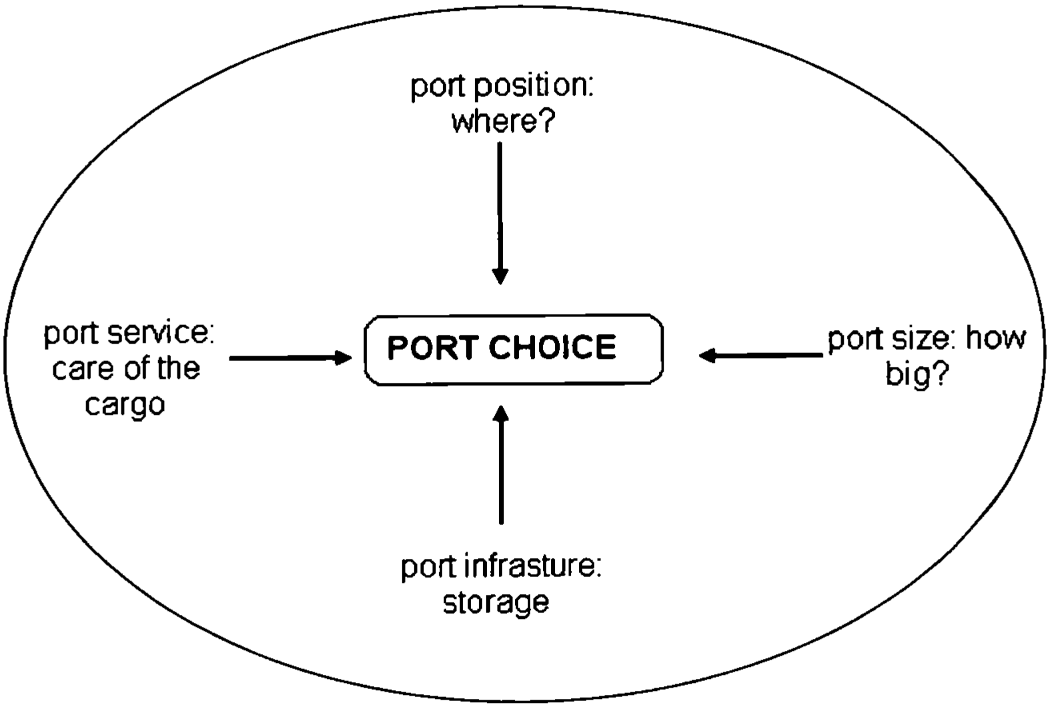


Figure 6-8 Port Choice

"Q. Would you move to another port ... if the port price went up? R. No ... there would be less to export. "(Clegg 2004 p. 7).

If there is no competition, (no other grain silos in the area), price does not affect port choice but it does affect throughput. This is a monopoly model.

If there is competition, (a port in the right place with the right infrastructure and able to handle the required shipload size and look after the cargo), price is the key issue, see figure 6.9.

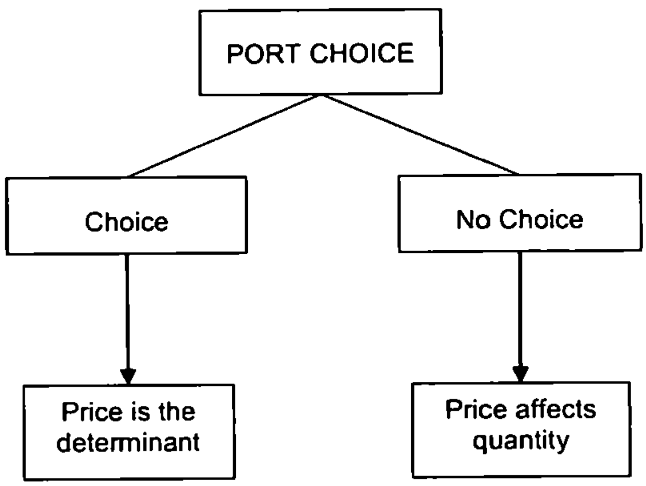


Figure 6-9 Port Choice and Price

No mention has yet been made of time in port or times of access due to tidal restrictions as factors in port choice: "Nobody is complaining about tidal restrictions" (Charlesworth 2003 p.4). Accessibility on more days in the year was mentioned in favour of Yelland as against Bideford but other factors overrode it so the Yelland project was not implemented.

Finally, putting together all the elements in port choice and price produces figure 6.10 the port choice model for small peripheral ports.

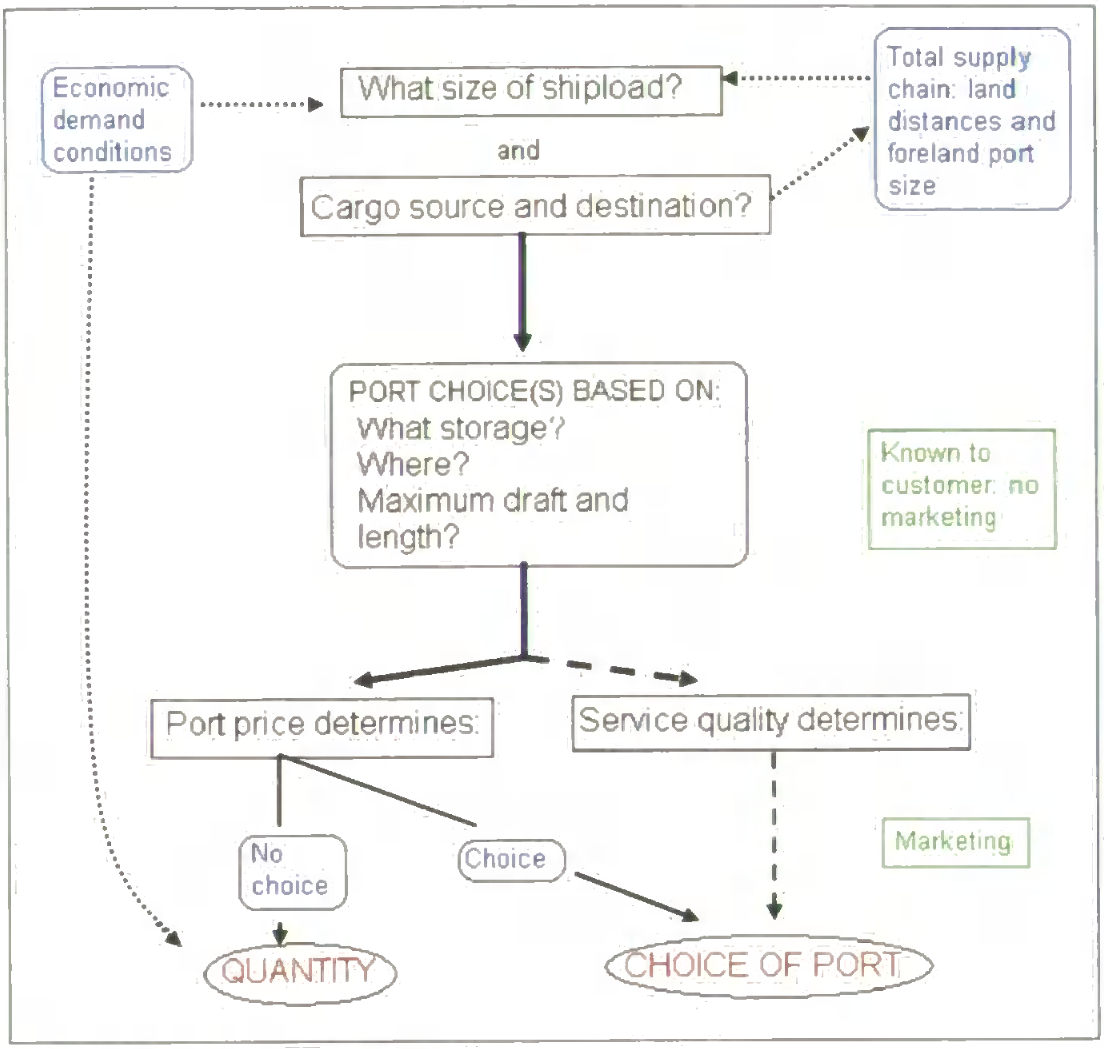


Figure 6-10 Port Choice Model

Secondary data: Port Pricing

The pricing of port services has an extensive theoretical and practical literature (Ashar 2001, Meersman et al 2002, ESCAP Transport and Tourist Division 2002, Strandenes 2004)). The way that port services are priced is as complex and variable as the ports themselves. Actual port charges fall into three different areas:

- *Wharfage and port dues (conservancy)*
- *Cargo handling and throughput*
- *Additional services to the ship*

(UNCTAD 1995, ESCAP Transport and Tourist Division 2002)

The charges may be payable only to the port authority, only to a private operator or to a mixture of port, terminal leaseholder, stevedores and individual service supplier. The charging unit also varies but it is usually by gross ton (the revenue-earning internal volume of the ship) for port dues. Charging is by tonne of cargo and cargo type for wharfage and all cargo services except storage, which is also charged by time period, and cranage, which is charged by the move. Charging is by the ship or ship dimensions or on a cost-plus basis for services such as pilotage, towage, mooring, boatmen, fresh water supply and garbage removal (UNCTAD 1995, ESCAP Transport and Tourist Division 2002). Who actually pays each charge also varies with the type of ship, type of trade and/or type of charter (ship hire agreement). Regional or coastal shipping is often charged at a lower rate to reflect the more frequent port calls of such ships: in addition, port charges may favour exports over imports or levy higher charges for more valuable cargoes (Strandenes and Marlow 2000).

There are three general approaches to pricing theory:

- *the economic approach: according to economic theory, marginal cost pricing will give the optimal price for economic welfare if there is perfect competition and no economies of scale. Calculating the marginal cost of a ship visit is extremely difficult in the face of joint and common costs (Meersman et al 2002).*

- *The pragmatic cost recovery approach: this normally prices on an average cost basis to ensure that all fixed and variable costs are covered. However, in practice much of port infrastructure is treated as a sunk cost rather than costing for depreciation and replacement (Meersman et al 2002).*

- *The public enterprise approach: this seeks to meet local development and economic activity goals rather than covering costs so it requires at least some public subsidy (Dowd and Fleming 1994).*

- *Strategic pricing: this accepts the current pricing system, whatever the historic basis, and reforms some elements and adjusts some prices up or down to meet the strategic objectives of the port. It will take into account the effects of changes on both customers and competing ports (Ashar 2001).*

The European Union would like to change all port pricing to a marginal cost basis but it does recognise the problems this poses for actual ports with limited information (European Union Commission 1997). Ports in the UK are not subsidised except in their historic costs. Private ports are expected to make a return for their investors. Even Trust ports are required to cover all their costs, although the councils that own Municipal ports can meet any of a port's investment costs, which are seen as direct development by the public sector and not subject to Europe Union State aid prohibitions. Generally, ports need to earn enough, and retain those earnings in ring-fenced accounts, to pay for investments or repairs to infrastructure. This is recommended for Municipal ports but not a requirement (Department for Transport 2006d).

6.2.12 Land and storage

Data relating to port land, storage and infrastructure.

Interview B (Plymouth Cattewater harbour master)

Storage is the key to increasing turnover. Berths must meet the minimal physical requirements of ships, but storage brings cargoes. Storage needs waterside land, which has a high opportunity cost in a port town, as more revenue could be generated from alternative uses. However, once land is lost to the port it is lost forever.

Interview C (Plymouth Victoria Wharf)

The value-added element of storage is vital to the profitability of the small bulk port. Lack of land to build storage inhibits the development of the port.

Interview D (Plymouth shipper)

The grain co-operative, Wessex Grain, confirms the importance of storage facilities to them. Storage sheds and grain silos are long-lasting structures with "a lifespan of forty years for a silo" (Clegg 2004 p.4). Capital investment in the port is in both storage and berth space.

Interview N (Truro harbour master)

Truro has made a policy in recent years of buying land near to the port. This will be leased out to port operators or developed for storage, allowing the port to grow and modernise. The port is operating a landlord model. Purchases have been made from retained earnings, which the port has been able to keep from the Council's General Fund because they are ring-fenced. Purchases have also been made possible because the land was still designated for commercial use and not changed to residential use.

It is unrealistic to expect the local planning authority to maintain an undeveloped 'land bank' available for future port development, as some have suggested in Plymouth, but land near to a port should be designated for commercial rather than residential use so that it remains within reach of a profitable and expanding port.

Secondary data: Land and Storage

This research began by exploring the port capacity decision made by small ports in Southwest England, because port capacity was seen as an indicator of a port's regional competitiveness. Port capacity was initially understood to mean berth capacity, in terms of size and number of berths. In fact, the research has shown that storage capacity is the most important factor, followed by an ability to handle ships of between 1,500dwt and 3,000dwt. Storage capacity is limited by the land area available to a port. According to UNCTAD, "Land means power. For this reason the port authority or the organization responsible for the development of the port area should never lose control of this valuable tool" (Bernard 1995 p.3). At Truro the port has followed a policy of "patient land assembly" (HR Wallingford Ltd 2003 p. 5). This has created new opportunities for building a common user storage facility as well as leasing land for lessees to build their own storage. Usually, though, a port is constrained by residential and other buildings around it. The traditional route for a port in that situation is to move downriver towards the sea, or to reclaim land. Those small ports situated upriver, however, gain their competitive advantage from being close to their markets (for example, Truro in Cornwall and Dunball Wharf in Somerset). The remaining small ports and wharves tend to be close to the sea already. Teignmouth has extended out into the river a short way, mainly to accommodate larger ships but also to allow new storage. Watchet enjoyed a revival of trade in 1965 after land behind the East Wharf, that had belonged to the railway company, became available for the District Council to buy for the port after the branch line to Watchet lost its goods services in 1962. The line past Watchet is now a private steam railway (Norman 2002). In Plymouth Cattewater, Dinwoodie (2003) reports that local businesses need added quay space and land for storage and processing. Bagging and packing add value to cargoes but need space. With limited land, most ports have to make the best of *their resources by modernising and rebuilding their storage to meet the present requirements of their customers.*

6.2.13 Inland transport links

Data concerning road and rail linkages with the port and its hinterland.

Interview L (Teignmouth local government officers)

Teignmouth has a difficult access through the town, but beyond the town there is a three and a half mile stretch of 'A' road to the A380 dual carriageway and then the M5 at Exeter. West Devon and North Devon, Somerset and the Midlands are all readily accessible. A rail track passes directly behind the dock but it is used for fast mainline trains that would take precedence over freight trains and there is no room for points or a loading yard. Victoria Wharf and Cattedown Wharves in Plymouth have good road access away from houses, which connects to the A38, one of the two main east-west routes in the Southwest peninsula. There is a rail link to the area but it is not used by Cattedown Wharves. However, there is some talk of creating a new rail connection. At Exmouth there are eight miles of 'A' road up to Exeter and the M5 and A38, and there is also a railhead (not used for freight) and land for development. Watchet suffered from very poor road connections with a mile and a half of 'B' road, then about 17 miles of winding roads to Taunton and the M5. Chris Muller, the harbour master at Watchet, claimed that it was the poor road links and high road transport charges, together with high port charges at Watchet, which led to the port operator going into liquidation.

Interview N (Truro harbour master)

Truro is situated at the western end of the Southwest peninsula with access to the best roads available there. It actually benefits from poor road access further up the Peninsula, which makes the water route a more attractive choice.

6.2.14 Harbour

Data relating to the shelter of the natural harbour and maintenance and repair of dock structures but not to dredging activities.

Interview A (Teignmouth port manager): physical port

Issues relating to the physical port encompass berth capacity and size, the state of the dock, the maximum size of ship that can be handled, the issue of drying berths, and land for storage.

The present situation is that:

- the quay wall is in need of repair
- the berths dry out which is not liked by the owners of new ships
- coastal shipping is getting bigger, with some already too big for the port
- there will be fewer, bigger ships in the future
- more storage space is needed

These are the drivers for the proposed port development, which will result in fewer but longer, wet berths and extra storage.

Interview J (Exmouth Residents' Association)

The list above has been broken down into separate categories. A category labelled 'harbour' has been formed to cover both the state of the dock structure and exposure of the harbour to bad weather.

Teignmouth is a natural harbour with good shelter but the dock structure is suffering from accelerated low water corrosion. Plymouth Cattewater is naturally sheltered except from the southern approaches, which are sheltered by Mountbatten Breakwater and the main Breakwater in Plymouth Sound. No comment has been made about the dock structures. Watchet is exposed from the north west and a run could set in. "If the wind happened to turn from southwest to west and then go northwest ... the swell and the sea created what we call a run and those vessels used to rub alongside although they were tied up, they'd move up and down alongside the pier and they did sometimes quite a bit of damage" (Muller 2004 p. 9). The entrance to the harbour is narrow and exposed to the north and there is a history of severe storm damage. The dock structure is old. Exmouth is an enclosed dock but there is again a history of storms breaking in to the dock. The entrance is exposed to the south. Both Exmouth and Watchet were rebuilt after storm damage based on least cost rather than longest life. A survey of the dock wall in Exmouth in 1989 found that it was unsafe for cranes to operate there and the dock was immediately closed.

Secondary data: Watchet Harbour

The Old Harbour at Watchet consisted of a beach to the east and seawall fronting the town on the south, protected from the west by a small jetty used to load ships with iron ore from the nearby Brendon Hills. A new harbour was built in 1863 at a cost of £15,068-10-2d with a longer, mainly wooden, west breakwater and a new east pier with an East Wharf that was built over the old beach and in-filled with rubble. The west breakwater was nearly destroyed by a severe storm in 1900 that also destroyed most of the ships owned by the town people. Not only had the sailors lost their livelihood: the ruined harbour threatened the viability of the town's industry. To raise the £16,183-3-5d needed for a new harbour the town was formed into an Urban District Council with the power to raise loans on the security of the town rate (local property tax). Work had barely been completed before another storm in 1903 caused a breach in the east pier. Another loan of £6,000 had to be raised to repair it.

The iron ore trade to Wales had ceased by this time. In 1911 the town lost its major shipper when a large flourmill burnt down and the owner decided to rebuild it at Bristol. In 1924 a warehouse (built very close to the edge of the Wharf, because most of the land behind it belonged to the railway company) and a large section of the East Wharf collapsed into the harbour. It was repaired in 1925 with a loan of £1,200. Trade revived in the 1930s but more repairs to the harbour were needed. The east pier was rebuilt in concrete for £3,000 in 1935 but work to the west pier was shelved. In 1937 a great crack opened up in the west pier after a gale, so that this had to be repaired at an estimated cost of £17,000. The concrete did the job because no more major harbour works were needed until the marina was built at the end of the twentieth century. The main cost to the town and, later, the District Council, was that of keeping the harbour dredged (Norman 2002).

Secondary data: Exmouth Dock

In 1989 Bingham Cotterell, Consulting Engineers, prepared a report for the Exmouth Dock Company on the state of the dock wall. This was a private report but it was published as an appendix to the Proof of Evidence, Exmouth Docks Harbour Revision Order 1997 (Bingham Cotterell 1989). Exmouth Docks were built in 1864/65 as a wet dock, with dock gates closed at high water (Exmouth Dock Company 1985). The original dock wall was built of stone, raked at an angle of 20 degrees to the vertical. Around 1930 the stone wall began to fail and repairs were carried out by driving steel sheet piling in front of the stone. This was intended to patch the stone, not replace it. In 1933 the dock gates were removed, leaving the dock as a tidal basin. In 1972 there was a toe failure of one section of wall and repairs were recommended for the whole dock wall. About 1981 the Exmouth Docks Company was acquired by new owners, a Mr. Carter (Cardy 2004). Repairs were carried out to the dock wall without the advice of structural engineers, being *completed in 1986. A new, vertical, dock wall made from sheet piling was placed in front of the old wall and the gap, including slipways, was filled in. In 1984 the dock entrance was widened by two metres, all small craft moorings were removed from the basin, capital dredging was undertaken and an extra berth created. Heavy crawler mounted cranes were brought in to handle cargoes (Exmouth Dock Company 1985, Bingham Cotterell 1989).*

The pier at the entrance to the docks was also unstable at this time due to corrosion of the sheet piling. In 1983 the pier became unsafe, collapsing in 1984. East Devon Council brought the Exmouth Docks Company before Exmouth magistrates who imposed an order for the pier to be made safe within six months. The order was to have been contested by the Docks Company but the pier collapsed after storms (Exmouth and East Devon Journal 1984). The pier was eventually rebuilt into a solid structure (Exmouth Dock Company 1985).

Bingham Cottrell were brought in to examine the dock wall in 1989. They advised that the new wall was unstable, the old sheet piling repairs were in poor condition and the original stone wall was disintegrating. There was a risk that use of the heavy cranes could result in a collapse of the dock wall at any time (Bingham Cotterell 1989). The dock was immediately closed to commercial shipping.

Interview N (Truro harbour master)

Porthoustock and Dean Quarry are completely exposed from the south and west. Truro, being a river port, is sheltered and approached from Carrick Roads, one of the finest natural harbours in the world. The dock at Truro was built by the Ministry of Defence in 1961 to service convoys that would gather in the River Fal and Carrick Roads before and after crossing the Atlantic in the event of war with the

USSR. Like the dock at Teignmouth, it is suffering from accelerated low water corrosion.

Secondary data: Accelerated low-water corrosion (ALWC)

Many ports have quay walls made from steel sheet pile. The structural steel is subject to corrosion (rusting) when in a wet condition because of electrochemical processes. Uniform corrosion results in an even spread of rusting. The rate of corrosion in seawater in different zones (underwater, low water, tidal, splash zone and atmospheric) can be estimated to some extent and incorporated into international design guidelines and codes such as the British Standards for Maritime Structures. These give guidance for the thickness and design life of a quay wall. Local corrosion is more serious, because it is concentrated into specific areas and it can result in very high rates of corrosion. Local corrosion can be caused by microbes, stray currents, erosion corrosion and galvanic corrosion (CUR 2005).

Microbiologically induced corrosion (MIC) is the result of films of biological organisms that attach themselves to the steel wall. They make the surface of the steel anaerobic (without oxygen), an environment in which sulphur reducing bacteria (SRB) can grow. These convert sulphur compounds into sulphides, forming sulphuric acid that rapidly pits the steel surface. SRB are found in parts of the steel wall below low water. Accelerated low water corrosion is a particular type of MIC and takes place, as its name suggests, in the zone between low water neaps and low water springs. There is less biological growth in this area and more oxygen available, allowing sulphur oxidizing bacteria (SOB) to grow. They also convert sulphides into a sulphurous acid that attacks the steel. In the transition zone where both SRB and SOB grow, a closed sulphur cycle develops with each *type of bacteria feeding off the waste products of the other, resulting in increased activity and a highly acidic, intensely corrosive environment (CUR 2005).*

Accelerated low-water corrosion (ALWC) is a recognised phenomenon in England, Germany, Denmark and more recently in Holland. It has attacked the quay wall in Teignmouth, which triggered the need for quay development or quay repair. It is also attacking the quay wall in Truro so that a similar decision will have to be made in the near future.

Steps can be taken to protect a quay wall vulnerable to ALWC, including a coating system, cathodic protection with sacrificial anodes attached to the steel or active cathodic protection. Repairs to badly corroded quay walls can be expensive and disruptive to trade if the steel is to be replaced. Alternative forms of repair include the in-filling of damaged areas with a special mixture of high-performance concrete (CUR 2005, Perry 2001). At Teignmouth the corroded sheet pile will be in-filled by the quay extension into the river.

Secondary data: Truro Quay

As well as buying up land next to Lighterage quay, Truro has invested in extending the quay from 330m to 370m and upgrading the quay surface for heavy cranes and cargoes. The work was funded by the Regional Development Agency in partnership with the European Union, using Objective 5b money to turn a derelict rubbish tip into an economic asset (HR Wallingford Ltd. 2003, Western Morning News 2000).

6.2.15 Dredging

Data relating to costs and procedures involved in maintaining water depth within the harbour approaches.

Dredging can be divided into capital dredging to *increase* the current water depth, and maintenance dredging to *keep* the water depth at its current level. Capital dredging is a port development issue. In this category, maintenance dredging also includes ploughing, when material is moved underwater without breaking the surface.

The problem with dredging is the cost and the disposal of spoil. At Teignmouth the channel is kept open by ploughing (also known as raking), which is relatively cheap and the spoil is dispersed naturally under water. The dredger/plough works for four or five days a week but it could be done every tide if conditions required it. At Watchet there was and is still a severe problem with silting, not washed downriver but caused by the very large tidal range and strong currents in the Bristol Channel. Dredging was a costly exercise that had to be carried out about twice a year. At low tide, a digger would drive in to the drying harbour and scoop up the silt into a trailer for disposal ashore (figure 6.11). The cost of dredging was the main reason for the very high port charges at Watchet.

There was no mention of dredging at Exmouth. At both Truro and in the Cattewater, maintenance dredging has to be carried out. The spoil is disposed of at sea at a cost of between £5 and £10 a cubic metre, in a licensed dumping ground. Environmentalists object to this and they lobby strongly against it. The spoil has to be analysed by the Centre for Environment, Fisheries and Aquaculture Science, and English Nature must approve the disposal. The main alternative is to

Figure 6-11 Dredging at Watchet at low tide

Source: Muller 1990

dump the spoil inland in a landfill site but this is significantly more expensive, especially with landfill tax. Contaminated spoil, as at Falmouth, would have to be dried out and buried in special landfill sites.

Secondary data: Dredging

The management of dredged material has significant economic and environmental implications for any waterway, port or harbour authority. Maintenance dredging has to be carried out to meet statutory obligations to maintain navigation, while all deepening and most construction projects require capital dredging.

English Nature, a Government agency set up by the Environment Protection Act 1990, is a statutory consultee for all dredging works. This is presently being amalgamated with other bodies to become Natural England from October 2006.

The main issue is dealing with the spoil from dredging. Uncontaminated dredged material can be dispersed without breaking the surface (raked or ploughed), disposed of at sea in a licensed dredging site (open-water disposal) or beneficially used. Contaminated spoil may have a beneficial use: otherwise, it must be treated and removed to a secure site. More than 90% of spoil is natural, unpolluted sediment but the rest has been polluted by industrial, municipal and agricultural activities. Dredging of contaminated material may be undertaken to improve the bottom environment as well as for commercial reasons, but it will tend to disturb the sediment and release the contaminants into the water column, potentially allowing them to enter the food chain. (IADC/CEDA 1999).

The Fal Estuary is contaminated with very high levels of tri-butyl tin (TBT), which was used in anti-fouling paints on ships and leisure craft from the 1970s. In 1987, the use of TBT on boats of less than 25m was banned in the UK after it was found that TBT leached out of the paint and entered the marine environment where it was toxic to oysters and other marine life (Carrick District Council 2004). In 2001, the International Maritime Organisation (IMO) adopted the International Convention on the Control of Harmful Anti-fouling Systems on Ships, which sought to phase out the use of TBT in anti-fouling paints by 2003 and remove or cover them by 2008. However, this had still not come in to force by June 2006 as only sixteen out of the required twenty-five states had ratified it (IMO 2006).

Falmouth Docks and Engineering Company Ltd. and Falmouth Harbour Commissioners are planning to build a new, deeper, cruise terminal to cater for the growing cruise liner traffic to Falmouth. This requires capital dredging and disposal of contaminated sediments. Captain Kent indicated in his interview that the sediments would have to be dried and taken to a special landfill, at great cost

(Kent 2005). However, an Environmental Scoping Study for the proposal, published in 2006, is now demonstrating plans to 'beneficially use' the contaminated sediment (the surface layer) as fill material and for land reclamation. Uncontaminated dredged maerl will be sold commercially and used for habitat creation. Uncontaminated sediments below the surface layer will be dumped at sea (Falmouth Docks and Engineering Co. Ltd. and Falmouth Harbour Commissioners 2006). As Captain Charlesworth said, "You have to be clever and beneficial uses have to be studied, all these sorts of things that can actually satisfy the environmental side of the equation" (Charlesworth 2003, p. 3).

There are three broad types of beneficial uses of dredged material: engineered use, agricultural and product use and environmental enhancement use. Examples are uses as aggregate mixed with cement to make concrete, beach nourishment, soil enhancer, management of landfill waste sites and lining and capping of contaminated spoil disposal sites. In a number of port projects, contaminated dredged material has been used for land reclamation in a confined disposal site (Paipai et al 2000).

Disposal at sea is the traditional method of dredged material disposal. Today it is subject to a number of international conventions such as the London Convention 1972, and national and local codes and regulations, including the Food and Environment Protection Act 1985 (FEPA). Harbour authorities typically have powers to carry out maintenance dredging but they need consent under the Coast Protection Act 1949 and a FEPA licence for open-water disposal (Carrick District Council 2004, UK Marine SACs Project 2001a). In England and Wales, the Department for Environment, Food and Rural Affairs (DEFRA) regulate FEPA licences. In 2006 the fees rose by an average of 22% so that, for example, a *licence for disposal of up to 9,999 wet tonnes over twelve months of maintenance dredged spoil (Truro typically falls into this band) now costs £3,000, up from £1,896 in 2001. Continuation fees over two or three years are slightly lower at £2,250 per annum (Marine Consents and Environment Unit 2006).*

Dredging and open-water disposal activities have a number of potential detrimental or beneficial effects. These effects may be:

- *Removal of flora and fauna (benthic communities) from the dredged site.*
- *An increase of suspended sediment from dredging, spillage from the dredger and dumping, which makes the water murky (turbid) and releases nutrients, contaminants and organic matter. This can have positive and negative effects.*
- *Smothering of seabed communities from settling of the sediment.*
- *Raising the level of the seabed (again this can be positive and negative)*
- *Changes in water flow and erosion caused by changes in the contours of the bottom profile. This is most likely to occur with capital dredging.*

(UK Marine SACs Project 2001b)

Activities within Marine Special Areas of Conservation (Marine SACs) are especially closely monitored. Special Areas of Conservation are set up to comply with the European Union's Habitats and Species Directive 92/43/EEC, which is generally known as the Habitats Directive. This aims to maintain the diversity of Europe's wildlife through conservation of important, rare or threatened habitats, and the habitats of certain species. Each country in the European Union is required to identify and manage sites on land and sea that provide the best examples of habitats and species listed in the Directive. The Fal and Halford rivers, and Plymouth Sound and estuaries, are marine SACs (JNCC 2006). The

Government has interpreted the Habitats Directive as requiring an assessment of the effects of maintenance dredging on Marine SACs. The ports industry does not necessarily accept that interpretation, but they have agreed to work with the relevant authorities to provide documentation that allows such an assessment to be made. Carrick District Council (Truro and Falmouth) produced a Baseline Document in 2004 (Carrick District Council 2004). At Plymouth Sound, a Tamar Estuaries Management Plan is produced at intervals. In the draft 2006-2011 plan, production of a dredging protocol is put down as an action point (Tamar Estuaries Consultative Forum 2006).

Prior to granting the licence, the dredged spoil must be analysed for contaminants. At present, that analysis is made by Centre for Environmental Fisheries and Aquaculture Science (CEFAS) laboratories. Beneficial uses must also be explored. Truro has experimented with using dredged silt mixed with china clay waste to make a topsoil substitute for derelict land reclamation (Carrick District Council 2004).

Dredging is a costly and bureaucratic exercise for any port, but especially for a port within or near to a Marine SAC. The amount of dredging required to keep open the navigation varies from port to port, depending on the nature of the site and the level of silting and water movement. Contamination of the sediments from sewage, TBT and old mine workings will increase the cost and difficulty of disposal and may, as at Falmouth, inhibit or delay capital schemes. This is part of the factor endowment of the port, but the modern port manager has to seek ways to reduce the level and frequency of dredging and to find beneficial uses for the spoil.

6.2.16 Ship size

Data relating to the multiple issues surrounding the length and draft of ships entering or wishing to enter the port.

Interview B (Plymouth Cattewater harbour master)

Confirmation that ships are getting bigger: the harbour is being pushed to take longer and deeper ships. Tidal restrictions are acceptable to ship owners. Length of ship is the key restriction (due party to quay length, but mainly because of the need for safe turning circles within the harbour, in the approaches or off the berth). Ship-owners building new coastal shipping have sometimes increased the breadth to allow greater tonnage without a proportionate increase in length (for example, *m.v. Asperity* and *m.v. Alacrity*, launched in 1997). Increases in draft can be accommodated to some extent by dredging the channel and berth, although there is a problem over the cost and disposal of spoil.

Ship size: theory

Interview C (Plymouth Cattewater Victoria Wharf, dock manager)

A constant theme is that ships are getting bigger. This keeps down costs through economies of scale. Ports need to develop to handle these larger ships. Ship size in the coastal sector has risen from 300dwt to 5,000dwt in the last thirty years. There have been similar increases in ship size in other, deep-sea sectors. In the post-war period tankers increased in size to a peak of over 500,000dwt in the 1970s, before falling back and stabilising at the current level of about 250,000dwt as demand conditions and routes changed. Dry bulk carriers also increased in size before Capesize ships (the largest types) stabilised at the current size range of 150,000dwt to 190,000dwt. Since the 1990s, container shipping and cruise shipping has entered a period of rapid growth in size, spurred on by increases in demand and technical improvements to the propulsion, materials and design of these types of ships. Rapid growth in ship size in a sector is therefore a common phenomenon, but these size increases do not go on forever. A peak size is reached at the limits of technology and demand (the demand being governed by optimum parcel size for the economic conditions and a minimum number of ports for flexible trading in that sector). The boundaries of technology are expanding in shipbuilding, ship propulsion, cargo handling and optimum use of cargo storage, but environmental constraints are closing in on shipping. Ports can be dredged and their storage expanded to keep pace with rising ship size, but at an environmental as well as economic cost. Some ports will always give up the struggle, thus constraining port choice and flexibility. The defining factor, however, is the final-user demand for the commodity carried by ships. This has a history of rapid growth, then levelling off as the industry matures.

Applying this analysis to coastal shipping, the question is when, and at what size, will coastal shipping stabilise at the optimum size for modern conditions? How physically big must a small port get to stay in business? The bigger the ship, the fewer ports it can enter, at both the loading and discharging end. Bigger ships also need more storage to build up shiploads of cargo, or receive them. Small ports tend to be constrained in the land available for them. Once parcels get above a certain size, these enter a different supply chain involving large ports and road distribution. It seems probable, therefore, that coastal shipping will stabilise at a smaller fleet of 3,000dwt to 5,000dwt ships.

Interview N (Truro harbour master)

The constraint on maximum size for small ships is the lock capacity on the major European rivers, where sea-river ships trade that are also capable of short-sea voyages.

Secondary data: The Short-sea Fleet

A constant theme from this research is that the coastal shipping fleet in European waters is aging and new ships, when they are built, are becoming larger. This is a specific threat to small ports rather than a threat to short-sea shipping in general. For example, crude oil is exported from the UK to the European Continent in Very Large Crude Carriers: this is short-sea shipping but involves only large ports and terminals.

The small coaster fleet is old because margins have been thin for decades, leaving few profits to invest in new tonnage, see figure 6.12. (Doll 2004, Elsom 2006). 'New' ships entered the European market after the collapse of the USSR in the 1990s. These ships, including the Ladoga class built between 1972 and 1989, traded on the inland waterways of the former Soviet Union. They are too big for most of the Western European waterways but they are ideal for small coastal ports and are now involved in the short-sea trades (Hilling 1999).

Economies of scale are the driving force behind the increase in ship size. Shipper demands are an opposing force suggesting a cap on ship size. For example, Wijnne & Barends were reported to have ordered four 2,000dwt ships in 2000 because, in the specialist area of forestry products "there are simply not the cargo shipments available for larger vessels" (Lloyd's List 2000 p. 15). A second opposing force is the size restrictions placed on ships trading on inland waterways. These would once have been barges without a seagoing capability, or small coasters with folding masts able to penetrate larger waterways.

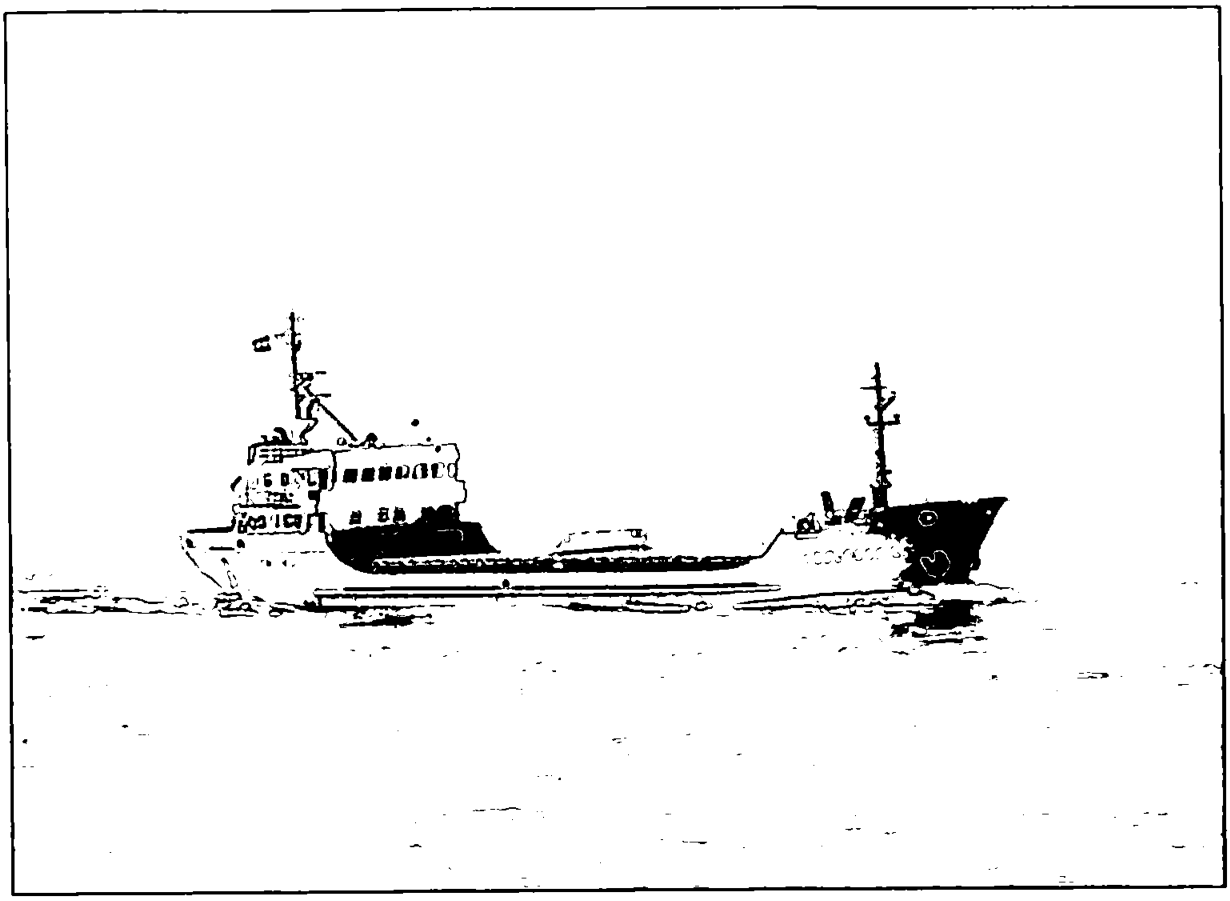


Figure 6-12 Older style of small coastal ship

Source: Tuck 2003

From the 1970s, there has emerged a hybrid vessel, the river-sea (or sea-river) ship capable of trading within the network of European river routes and out to sea (these are colloquially known as 'sea-snakes' within the short sea trades). The main technical innovation was a hydraulic wheelhouse able to rise up at sea to provide a lookout and retract in waterways to pass under low bridges (figure 6.13). Other innovations include hydraulically lowering masts and opening hatches, able to be operated at the touch of a button (reducing crew fatigue), unmanned engine rooms, box shaped holds designed to the dimensions of a standard container (20 feet by 8 feet by 8 feet 6 inches or 9 feet 6 inches high), wide hatch openings for ease of cargo working (no dark corners needing to have cargo pushed into and pulled out of) and flush sided cargo holds with all the strengthening frames tucked *into water ballast tanks in the sides and bottom. This makes the holds easy to empty and clean for the next cargo, reducing crew labour (the crew typically sweep out the last of a bulk cargo and wash down the hold). Empty ships can be ballasted so that they sit lower in the water for passing under bridges (the air draft of a ship is the distance from the waterline to the highest point - river navigation requires a low air draft).*

Figure 6-13 River-sea ship with hydraulic wheelhouse

Source: Tuck 2003

For river navigation a ship needs a flat bottom and good manoeuvrability provided by such equipment as bow thrusters, Becker rudders (a rudder with an extra flap area, making the ship highly manoeuvrable at low speeds), controllable pitch propellers or water jet propulsion. They also need a narrow beam. The flat bottom and narrow beam conflicts with the requirement for good sea-keeping qualities, which can limit the use of these ships during winter in the North Sea and West

Coast of Ireland and Britain (Rissoan 1994, Hilling 1999). Research and development is taking place to design a new generation of river-sea ships that are better able to cope with these conditions (Cinquini et al 2001, HSB International 2004).

The dimensions of a river-sea vessel are restricted by the water depth, lock chambers and bridge heights of the major European waterways. European inland waterways and ports of international importance (E waterways and ports) are classified from class IV (meeting the minimum standards for E waterways) to class VII. River-sea ships are recommended to be capable of navigating on class Va and VIb waterways (Economic Commission for Europe Inland Transport Committee 1998). Typical dimensions of a river-sea ship are:

Length: 82m (in Scandinavia) to 135m

Beam: 11.4 metres (in Continental canals) to 24m in major waterways

Draft: 2.5m (upper Rhine) to 5.5m

Air draft: generally less than 7m or up to 44m on major waterways

(Rissoan 1994)

River sea ships were originally less than 1,000dwt but increased in size with other coastal shipping to about 3,000dwt. A new generation of river-sea ships was built in the late 1990s and these tended to be smaller at about 1,500dwt (European Shortsea Network n.d.). The environmental benefits and potential for integrated transport by canal, river and sea has led to a growth in investment in ships, inland terminals and waterways. The UN/ECE Working Party on Inland Water Transport publishes a 'Blue Book' of E waterways and ports and identifies 'missing links' and bottlenecks in the network. Low water levels in summer and flooding in winter *(which reduces the available air draft) cause problems at times, but this is a thriving and growing transport sector (Economic Commission for Europe Inland Transport Committee 1998, BIMCO 2002).*

6.2.17 Port labour

Data relating to dock workers

Most of the dockworkers are directly employed and flexible in their work. There is no problem in recruiting and training them although skilled workers are more difficult to find. The work is no longer labour-intensive and few dockers are now employed. The work can be dangerous and involves exposure to the weather. The winter is the busiest time and part-time or self-employed workers may be taken on at peak periods.

6.2.18 Management and ownership

Data relating to the ownership and management structure of the port and the attitudes of the port owner and/or manager.

At Teignmouth, Victoria Wharf and Cattedown Wharves, the commercial dock is privately owned and run as a subsidiary of a much larger group, while the harbour is a trust. Teignmouth is owned by the Teignmouth Quay Company, a subsidiary of ABP. Victoria Wharf is part of Victoria Group, which owns five small ports in England. Cattedown Wharves is a subsidiary of F.T. Everard and Sons Ltd. who are best known as a coastal tanker shipping company. Exmouth dock was privately owned by the Carter family but the Exe estuary was run by Exeter city council. The Exmouth Dock Company is now owned by the housing development company. At Watchet, the port was owned by the district council and controlled through the Technical Services Committee. The port was leased out to two operators until the late seventies when one went into liquidation. The port carried on with only the one operator, Watchet Marine, a subsidiary of Charles M. Willie & Co. of Cardiff. When Watchet Marine went into liquidation the council looked for another operator to take over the entire operation. All suggestions for further use of the port had to go before the Committee and the harbour master was given very little authority to find more work for the harbour. Porthoustock was owned by Amalgamated Roadstone Corporation (ARC) before its closure: ARC closed Porthoustock and invested in Newlyn quarry. Porthoustock now belongs to Carnsew Quarries (Aram Resources) who re-opened it a few years ago. Dean Quarry was once owned by F. T. Everard and Sons Ltd. but more recently it was owned by the RMC group. Cemex bought RMC in 2005. Truro is owned by the local authority and operated by several private operators who lease the land from the port. The port has separate financial accounts from the General Fund of the local authority so it can retain its earnings. The harbour master has a good deal of autonomy to run the port.

As can be seen, port ownership structures are extremely diverse. What seems to matter is that the port/harbour manager is dynamic and entrepreneurial, "I am impatient, this is my vision - I will drive it forward" (Greenwell 2002 p. 12). The manager also needs freedom to act, a freedom not available at Watchet, for instance:

> But there you are. I was only an employee of the council and I've even been told what to do, in the end. Although I had control over the Harbour and nobody could take away that but if you are looking out for new trade you have to look and then go to committee and "Oh well I don't know." (Muller 2004 p.17)

Access to future earnings or retained earnings for investment in the future of the port is also important: "When I put this new proposal in I was dragged up to the boardroom and questioned, but I got it through" (Greenwell 2004 p.2). Also, "whilst we are a local authority harbour ... we have ring-fenced accounts so ... we don't pay anything into the General Fund nor do we take anything from it, which means that we've got our own bank account." (Brigden 2005 p. 4). Passively milking the port as a source of income is not in its long-term interests, but equally too much dynamism in a weak shipping market, where the operator owns the land, can lead to the short-term option of high profits from closure and residential building.

Secondary data: Trust Ports

After the General Election of 1997, the new Government halted the forced sale of large trust port authorities, but undertook a review to examine allegations made by those trust ports that had chosen to privatise and other supporters of the privatisation of trust ports. It was claimed that trust port status placed them at a commercial disadvantage, as they were unable to raise money on the capital markets by pledging their assets, for example, or to diversify their activities. It was also claimed that management and employee ownership of shares in the privatised company would improve accountability rather than diminish it, despite the fact that a trust port is supposed to be accountable to all its stakeholders (Baird 1995, DETR 2000b).

The results of the review were damning. It looked mainly at the issue of accountability and found "the review has provided little evidence to dispel concerns over general issues of accountability" (DETR 1998 p. 5). It also found that many trust boards lacked the knowledge or ability to be effective in a commercial sense. Boards were too big; stuffed with vested interests; not working for the good of the wider community; accountable only to themselves; and undesirable board members were difficult to remove. Many appointments to trust *boards were the prerogative of the local authority and these came in for particular, if veiled, criticism in the Review. In the Government policy document "Modern Ports" (DETR 2000a) it was stated that local authorities were not appointing local people to trust boards and it was implied that their appointees were more concerned with the good of the local authority than with the good of the trust port community. The review recommended that guidelines be developed by the Department, establishing the principles of good governance for trust ports. It also demanded that all non-fisheries trust ports prepare and deliver their annual accounts to the Secretary of State as required by statute, and proposed that these should be published and accompanied, for larger ports, with a business plan.*

The issue of commercial disadvantage for trust ports was reviewed in the context of port legislation, which threw up wider issues of legislation for all ports. Most ports have local Acts of Parliament setting their powers. It was recommended that a model of port powers should be produced, which could be incorporated within a port's local powers. In addition, port byelaws needed to be audited, modernised and enforced in a sensible manner.

The views of interested parties were invited concerning the principal recommendations of the review. The document, "Modernising Trust Ports: a guide to good governance" was produced in 2000 (DETR 2000b). This provided comprehensive guidance on the number, composition, appointment, remuneration and duties of trust board members. It also contained further implied criticisms of, for example, the remuneration levels of some trust boards and the fact that a statutory requirement to provide a report with the annual accounts "is honoured in the breach" (DETR 2000b p. 43).The appointment process should conform to the Nolan procedures issued by the Office of the Commission for Public

Appointments, as well as to broader standards of inclusiveness. With the exception of the production of annual accounts and a report, most of the document was no more than recommendations because trust boards are independent of Government and not required to conform to the Nolan procedures. Trust ports must meet their statutory obligations even if they conflict with the Guidelines, although the Department promised help in updating the legal framework for individual ports. In particular, where ports need to update their statutory framework with a Harbour Revision Order, the Department offered swift help for those ports complying with the Guidelines.

Municipal Ports

Having reviewed trust ports, the Government turned its attention to municipal ports in the document "Opportunities for Ports in Local Authority Ownership (Department for Transport 2006d). This was the report of a review of municipal ports, carried out because of the following problems:

- *Lack of public accountability with a narrow reporting requirement for the harbour management*
- *Municipal ports generally being treated like any other local service or a property portfolio, with no proper understanding of port business*
- *Poor financial performance with ports needing an operating subsidy*
- *Profits from port operations being paid into the General Fund (to avoid debt for the local authority, under previous rules). The result was a lack of funds for port investment and renewal*
- *Many local authorities set harbour dues to maximise income from visiting leisure craft, to the detriment of local and commercial users*

It was recommended that municipal ports adopt the standards of openness and accountability laid down for trust ports. The ports should consider producing a business plan in conjunction with port stakeholders. Financing and accounts should move towards a commercial model, with a strategy designed to bring the port into profit; ring-fenced accounts; provision for depreciation and future investment (ideally from retained profits) and freedom, when profitable, to borrow against future earnings. Port management needs the structures and freedom to manage the port on a commercial basis. A harbour management committee structure that included outside expertise and reported to the full council was recommended as a benchmark model (Department for Transport 2006d).

6.2.19 External environment

Data relating to changes that are external to the port and that have a commercial effect on the port.

Abolition of the Dock Labour Scheme

The Dock Labour Scheme was abolished in 1989. This took away one of the advantages enjoyed by the smaller, non-Scheme ports, "One of the advantages we had was apparently the local blokes just worked, there's no sort of big union issues ... but when that got taken away that just equalised across the range so Watchet lost its advantage" (Lang 2003 p. 6). Exmouth closed in 1989. Watchet closed in 1993 after struggling for some time.

Changes to the Entrance Channel

In Teignmouth, the Water Board put in a straight channel for sewage outfall pipes. That channel means that Teignmouth can now rake or plough the channel to maintain water depth rather than dredge it and pay for spoil disposal.

Labelling Directives on Animal Feed and Foodstuffs

European labelling directives (brought in after BSE infection in cattle) mean that each consignment of animal feed must be kept separate, with full traceability. "All rape used to go into the rape shed, now it has to go to different bins and current stock has to be separated from the next shipload" (Greenwell 2002 p.11). This has reduced storage capacity by 40%.

Loss of Dredging Licence/Loss of an important Cargo

Truro lost its main cargo at the start of 2005 when the licence to dredge calcified seaweed was revoked. This was because the maerl beds lie within a Special Area of Conservation and dredging was said to be taking away a finite resource and causing damage. Loss of the cargo meant loss of the stevedoring services at the port as well. Cattedown Wharves lost an important cargo when the Blue Circle cement factory, that used to export from there, closed down. At Exmouth, animal feed cargoes were lost when a European Union grant ended.

Ministry of Defence

The current quay at Truro was built in 1961 by the Ministry of Defence, which joined the upper and lower Newham Quays.

Taxation Changes

Primary aggregates, such as those quarried at Porthoustock and Dean Quarry, are subject to a tax of about £2 per ton. That disadvantages the quarries but makes secondary aggregates, produced by the china clay pits, a more attractive cargo.

Flood Defence Schemes

The port and Back Beach area of Teignmouth was identified by the Environment

Agency as being at risk of flooding when a high spring tide combined with other factors. A preventative scheme was proposed that would have seen the whole area protected by a flood barrier. This scheme was exhibited to the local people and then put to the vote. It would have meant building three feet of walls around the whole area, an area with no recent history of flooding, with all the visual impact that entailed. The people voted against it. In Truro, on the other hand, the quay wall has been incorporated into a flood scheme with a metre-high barrier along the edge of the quay (see figure 6.14).

Figure 6-14 Lighterage Quay, Truro, showing the flood wall
Source: The Author

The quay has a limited life due to accelerated low water corrosion, but the Harbour Master at Truro is hoping that the Environment Agency will contribute towards the cost of replacing both quay and flood defence.

Secondary data: Bideford

Bideford is an ancient port town situated on the river Torridge, south of the Taw

Torridge Estuary (see 'Secondary data: Yelland Quay' below, section 5.3.31). A 400-metre quay in the town centre is still used for loading ball clay cargoes and discharging fertiliser, and also for fishing boats and the ferry M.S. Oldenburg that services Lundy Island. The quay has been flooded on a spring tide on a regular basis in recent years and adjacent properties were flooded about every five years (Environment Agency 2004). A flood defence scheme was put together by Torridge District Council and the Environment Agency in the early 1990s but rejected by local people in a referendum. A new, £4.3 million scheme to build a floodwall and enhance the working quay in the town centre went back to parish voters in November 2000 (Clough 2000). The scheme went ahead and included widening the quay by 400 metres and raising the southern half. The northern half, used by shipping, was slightly raised and then protected with a floodwall at the rear of the quay. Enhancement works were carried out with tree planting, paving and seating. The Quay remains both a working port and an important tourist attraction (Environment Agency 2004, Short 2005).

6.2.20 Environmental concerns

Issues relating to the environmental impact of the working port.

Interview B (Plymouth Cattewater harbour master)

Concerning environmental issues, there is pressure to leave things as they are, to preserve the *status quo*. To take any action requires an effort to overcome this environmentalist inertia.

Environmental concerns: dust

Interview E (Exmouth dock manager)

In both Exmouth and at Victoria Wharf in Plymouth there are reports of dusty cargoes causing problems for nearby residents with subsequent complaints to the port. "We've got an ongoing problem with local residents all the time because of dust problems." (Petherbridge 2003 p.3) and "the town was white and there was lots of people complaining" (Graham 2004 p.4). Money has been spent on new equipment to mitigate the dust problem at Victoria Wharf but no attempt seems to have been made to reduce it in Exmouth.

Interview F (Watchet local council)

Because of the nature of the cargoes at Watchet, dust was not a problem. There was a problem of paper blowing around from the waste paper cargoes and from the noise of lorries in the night, but only a few people complained.

Interview H (Watchet harbour master)

The working port did not receive unconditional support from the people of Watchet. They complained about the waste paper, sand and the noise of lorries. They also turned down the prospect of a fish packing business because they did not want the smell of fish, despite the fact that it would have brought employment and kept the harbour alive (Watchet was never a fishing harbour). What the people wanted was a nice, clean, quiet port with ships and income but without mess, smell or noise. Because the port was owned by the district council any major changes had to be approved by a committee of the council, so public opinion was able to block any proposals that were not liked. People wanted the idea of a port but not the dirty, noisy, smelly, commercial reality.

Interview M (Porthoustock, Dean Quarry and Truro, chief pilot)

Positive

Short-sea shipping keeps bulk cargoes off the roads, substantially reducing congestion and pollution.

Employment – but not as much as there used to be. The port no longer 'pays for the town'.

"A nice mix" of ships and leisure craft on the water. The sense of vitality.

The port is part of the identity of the town.

Negative

Ports generate increased local lorry traffic both day and night resulting in congestion, noise and spilt cargoes. Airborne particles from cargoes such as waste paper, potato chippings, and fishmeal, and dust from china clay leads to breathing problems and covers cars and houses. There is noise from loading ships. Dredging leads to problems of spoil disposal because it is cheaper to dump at sea but that can damage the seabed. The harbour bottom and approaches can be contaminated by TBT and junk lost overboard. Building bigger storage sheds spoils the waterside view and piles of scrap metal cause visual intrusion. Building bigger quays requires the taking of beaches and foreshore. Bigger ships and bigger cranes increase the port's impact.

6.2.21 Development plans

Data relating to past and present plans to develop the port.

Teignmouth has plans to extend and straighten the quay wall to accommodate larger ships with a straight line of 300m, and build it out to create more space for cranes to work and for storage. The berths will be dredged to keep most ships always afloat. This is driven by the need to take fewer, larger ships whose owners do not like them grounding at low water, by corrosion of the present quay wall, by the need to extend the bottom of the quay apron so it is wide enough for a crane, and by the need for more storage. This development is supported in principle by the District Council.

Victoria Wharf has plans for a small berth outside the present dock area. This would take small ships that could ground at low water, leaving the current dock free for one large ship instead of two smaller ships as it is presently used. This is a cheaper option than the original plan for a big, deeper jetty, which was supported by the Harbour Commissioners and by the City Council. Victoria Wharf has also invested heavily in new storage sheds, as has Cattedown Wharves.

The disused jetty at Yelland in north Devon (which used to service a power station, now demolished), was bought by Victoria Group with the intention of developing the site for the storage and the export of china clay. Although planning permission had been granted and work had been carried out on preparing the site, the china clay company WBB Minerals lost interest and in 2003 the plan seemed to have been abandoned.

Exmouth had plans to build a jetty outside the dock by reclaiming and extending a beach. The jetty would have been able to take 3,000dwt ships. This was deeply unpopular in the town and planning permission was refused by the council. Had the project gone ahead the port need not have closed as it did in 1989, and may not have had to close at all. Watchet had no plans for development, although the working quay had been strengthened to take containers in the past.

The jetty at Porthoustock was extended by 30m by its current owners to take larger ships up to 2,000dwt. Plans for a conveyor belt from the crusher to the jetty were not carried out due to financial constraints. Plans exist for a new, deep-water jetty at Dean Quarry to take ships up to 10,000dwt but they have not been pursued.

At Truro the port has invested in land close to the port and made the quay longer. There are plans for two stores, one for grain and one for palletised goods. There is also capital dredging further downriver at a leisure jetty.

Development at Teignmouth

The Teignmouth Quay Company was founded in 1887 and bought by Associated British Ports (ABP) in 1987 shortly before Exmouth docks closed (ABP Marine Environmental Research Ltd. 2002). This closure doubled trade at Teignmouth, and trade remained high despite the recession of the early 1990s (Heath 1994). In 1992 an old, indented dock was filled in (but the port gave an undertaking that it would not build on the land, an undertaking which it still observes) (Greenwell 2002), and a new 90m quay was built for £500,000, with a 3,000 tonne animal feed store. Cargoes in the early 1990s consisted of ball clay exports, and imports of coal, fertiliser, stone and wood pulp. Imports of timber and slate tiles were lost during the recession. Investment in new plant and machinery was made in 1994 (Heath 1994) and by 2000 the port was reported as being busier than ever (Salter 2000). However, ships were getting bigger and this did cause problems. In 2002, with trade still increasing, a Russian cargo ship, the 114m long and 3,135dwt m.v. Sormovskiy, *went aground at the entrance while entering the port. It was refloated with the aid of tugs within hours (Ware 2002a). That same year the port announced an ambitious £4 million redevelopment plan. The remaining No. 1 Dock was to be filled in and a new 30,000 square foot store built over the ground. The Western Quay (upriver) was to be extended and straightened (although still leaving a kink in the line to aid turning, and to leave the Salty, a drying bank off the* *quay, intact). The line of the quay was to be lengthened upriver by incorporating some municipal land from Poly Steps, a public slipway. The Western Quay would also be extended into the river by a few metres and infilled, extending the apron (quay surface) so that a lorry could pass safely between a crane and the storage shed next to it. The riverbed alongside the quay would be dredged (capital dredging) so that ships could lie always afloat at low water within a deep pocket. All of this was to be financed by ABP from retained earnings (Greenwell 2002, Greenwell 2003). Building the shed came within the Permitted Development rules, but the rest of the development would require a Harbour Revision Order and the agreement of the District council to sell their land. It was hoped to complete the work within two years (Ware 2002b).*

The stated drivers for the port development were:

- *Changing ship size. The current configuration offered five berths in total: two very small berths in the dock only able to handle ships up to 70m in length, two medium sized berths and only one berth capable of handling ships longer than 90m. With the number of larger ships increasing, it was leading to congestion in peak times.*
- *The newer, larger ships were not prepared to take the ground whilst alongside at low water.*
- *The need for traceability of animal feedstuffs reduced effective storage space by 40%. A new, modern store was needed as cargoes were being lost.*
- *Accelerated low water corrosion of the steel piling within the dock and on the Western Quay demanded remedial work of some kind to replace it.*

(Ware 2002b, ABP Marine Environmental Research Ltd. 2002)

The hope of a swift granting of the Harbour Revision Order was over-optimistic. Residents next to the quay complained bitterly because the new storage would ruin their view over the river (Western Morning News 2002). The Teignbridge District Council considered the plans carefully, including the Teignmouth Quay Development Environment Statement (ABP Marine Environmental Research Ltd. 2002). Most of their recommendations were environmental and echoed the statements in the report, but they asked for a number of conditions around the issue of public access through the port to Polly Steps. They also asked for a new slipway to be built with quayside facilities, and forwarded a holding objection to the HRO until agreement had been reached on the outstanding matters (Teignbridge District Council Executive Committee Minutes 2003). Agreement was eventually reached so that both the District and County Councils supported the application, but the Teignmouth and Shaldon Environment Society and Teignmouth Action group (TAG) objected to the Harbour Revision Order. As a result, the Secretary of State was forced to call a public inquiry. This was held in September 2003 and lasted only two days (Smith 2004). However, the decision by the Secretary of State was held up by other, major HRO applications and it was not until September 2004 that the application was approved (The Teignmouth Quays Harbour Revision Order 2004).

In April 2005 ABP announced plans for further development at Teignmouth. This was a £2 million project in conjunction with Civil and Marine Slag Cement to demolish an old shed and build a hermetically sealed storage shed with a Kavako pneumatic unloader for importing slag cement from Port Talbot in Wales (another ABP port). The new handling equipment would ensure closed cargo handling without problems of dust (Sandes 2005). Slag cement or ground granulated blast furnace slag (GGBS), is a by-product of the manufacture of iron in a blast furnace.

The molten slag is tapped off separately from the molten iron and rapidly quenched with water to make it into glassy granules. When the granules are ground, they become a high-quality cement powder (Slag Cement Association 2006). The project was to be financed through a £967,824 Water Freight Facilities grant because of the 1,947,000 lorry miles saved from Wales to the Southwest (2006b). The remaining £1 million pound investment was to come from ABP on the strength of a 15-year contract (ABP 2005, Corlett 2006).

The first quay came into operation in November 2005. In July 2006 ABP was taken over by a private equity firm but the future of Teignmouth had been secured with more long-term contracts with Mole Valley Farmers to import fertiliser, and with WBB for ball clay exports. The full £5 million investment by ABP in Teignmouth was completed by September 2006 (Corlett 2006).

6.2.22 Development Funding

Data relating to the financing of infrastructure and superstructure developments.

Interview A (Teignmouth port manager)

The capital for the proposed development is coming from ABP, based on a 15% Return on Investment (ROI) as promised to the shareholders. There are issues here of residual value and the time span over which the investment must make a return. Ten years is not long for a capital investment into a facility that could last for decades. The investment depends on the new storage sheds, not an increase in berth capacity. Storage earns the money.

Interview M (Porthoustock, Dean Quarry and Truro, chief pilot)

A small port cannot stand still and survive. It needs finance for development work.

This appears to be relatively easy for building storage sheds but financing quay extensions on a commercial basis (with a ten-year payback) is very difficult. However, new or extended quays and capital dredging are important to allow small ports to keep up with increasing ship size and to replace ageing infrastructure. Many proposed developments are stopped or scaled down by lack of finance.

Interview N (Truro harbour master)

Grant money is available for port developments through Water Freight Facilities Grants and through Objective One money in Cornwall, but it takes years to negotiate. Road improvements can be financed by the County Council. Local authority harbours have prudential borrowing powers that give them some freedom to invest, but again there is the need to service and pay back the debt from earnings within a relatively short span of time.

Secondary data: Water Freight Facilities Grant

Freight Facilities grants were introduced in the Railways Act 1974 to help the capital funding of projects designed to move freight from roads to rail. The amount of money offered depended on the potential saving of lorry-miles as well as the size and economic viability of the project. In 1981 the grants were extended to inland waterways projects as well as rail, but still with the same eligibility criteria. It enjoyed some success but only part of the money allocated to the scheme was taken up because of a shortage of eligible projects. Between 1974 and 1996, 155 grants were made to a total of £72.3 million (National Audit Office 1996). Water freight facilities grants were extended to coastal shipping in 2001. Like the original grants, these were purely for capital funding, but in 2004 clearance was received from the European Union to offer a limited operating subsidy for the start-up of a new scheme as well. Grants for buying coastal ships are not allowed because it *would distort competition, although inland waterways barges are allowed under the scheme (Department for Transport 2006e).*

6.2.23 Harbour Revision Order for port development

Data relating to the granting of a Harbour Revision Order for development of the port.

Interview L (Teignmouth local government officers)

A Public Inquiry was held into the proposed Harbour Revision Order to amend the line of the quay at Teignmouth. The inquiry only took two days although it had been expected to take longer. There were some objections from local interests. The local authority had some reservations but these were dealt with before the inquiry. " We recommended against granting it until a range of conditions are met and the company ... met with recommendations or legally agreed to them before it got to the public inquiry, so we were able to withdraw our objections" (Smith 2004 p. 23). The port needed to buy some of the public slipway land from the council to extend the quay, for which the council insisted on a package of measures to upgrade access and services. The port presented an extensive Development Statement based on research including the effects of the new line of the jetty on the water flows.

By making a comparison between the situation at Exmouth (where the local council quashed a development proposal) and that at Teignmouth, it is clear that a port needs to maintain good relations with the local people and politicians if developments are to go ahead.

Secondary data: Harbour Revision Orders

Where a proposed port development will affect the navigation in a port, or where changes are proposed to the constitution of a port, the 1964 Harbours Act allows a Harbour Revision Order to be made. Ashore, some developments within a port are allowed by permitted development rights, but beyond that, planning permission must be obtained for work up to the low water mark (Department for Transport 2003).

Under schedule 3 of the 1964 Harbours Act the Secretary of State for Transport must hold a public inquiry if even one objection is made to the order and not withdrawn. This has been used in the past to 'hold the port to ransom' in order to prevent a lengthy delay in necessary development (Hansard 2005). A Harbours Bill, which will give the Secretary of State discretion to provide a written answer to frivolous objections, is presently moving through the legislative process.

6.2.24 Local politics

Data relating to the interactions between the port and the local government structures.

Interview L (Teignmouth local government officers)

An informed and engaged local government can mediate successfully between the local community and the port. It can engage with local people while looking at the wider picture of economic growth. Where mediation fails there can be suspicion (for example, that local councillors are in the pocket of developers), dissatisfaction and stifled or inappropriate development.

At Exmouth, the situation was complicated because the town lacked a town council from 1974 until 1996. It was administered by a committee of East Devon District Council. The more politically active Exmouth residents did not have confidence that the committee had the best interests of Exmouth at heart and campaigned for a town council. It was not until after the town council was created in 1996 that, for example, Sybil Cardy, who had been elected to the new town council, became aware of what had been happening with the port, especially the planning applications and the issues raised by the residential development of former port land. By then the land had already been granted change of use from industrial to residential zoning. "Because there wasn't a statutory council we didn't know too much about it at all in fact it was kept very much behind-the-scenes" (Cardy 2004 p. 9). Even when there is a local government structure that engages councillors with the issues, there may well be an asymmetry of information, "I knew that this public inquiry was coming up and knowing that I really knew absolutely damn all about it, how could I as deputy mayor speak about anything?" (Cardy 2004 p. 13). It is generally the officers of the local authority who understand the situation because they are, or should be, working with the interested parties on a day-to-day basis.

6.2.25 Public perceptions – not environmental

Data relating to the perceptions and feelings of the public towards the port town, port activities and waterside land.

Public suspicion of the stated reason for development

At Teignmouth, the public is concerned that the proposed development is an attempt by the port to create more land by extending the quay into the river: that it is an attempt to 'steal' land. There is also fear that the new storage sheds are being built for general logistics and warehousing activities rather than for port-related activities. A proposed flood defence scheme was linked in with the port development proposal and a 'hidden agenda' was suspected, "Lots of small ports around the UK (the nearest example being Exmouth) have closed and become comparatively expensive residential buildings ... there was concern that they were doing it for that purpose" (Smith 2004 p. 2).

Perceptions of the town: a port town, a seaside town or a market town?

Interview N (Truro harbour master)

Watchet is a port town with a long and proud maritime heritage. "The port was Watchet and Watchet was the port" (Lang 2004 p. 3). The famous narrative poem, *the Rhyme of the Ancient Mariner* by Coleridge was partly set in Watchet. It was also a working town with a paper mill and a large working age population. None of this helped to save the port from closure, but it did make the transition to leisure use more difficult.

Exmouth, on the other hand, is a seaside town that happened to have a port. The port seems to have been heartily disliked when it was operated in the 1980s. "The people in the town were simply saying, about 1987 they were saying, 'Anything is better than what we have got'" (Pawson 2004 p.1). After the port closed some of the residents expressed regret that they could not have kept a 'clean' port with all the goods going by rail.

Teignmouth is seen as a seaside town by many residents and most incomers, but the mixed leisure and commercial use of the river gives it a unique identity. "You can be having a beer on the Back Beach or on Shaldon, turn round and look up and see this massive freighter passing you followed by a kid in a dingy. It's a nice mix" (Smith 2004 p. 28). Much goodwill towards the port has been lost with the erosion of jobs, the perceived congestion of roads by lorries and the building of large, modern storage sheds. The local council supports the port because it has a clear understanding of the wider effects of losing it. In particular, loss of the port would seriously threaten the livelihoods of all the workers in the Bovey Clay Basin. "The people who live around the mining industry ... understand the importance of the dock" (Clark 2004 p. 28).

The perception of local residents towards the Cattewater wharves in Plymouth was not explored during the interviews conducted there, except their attitude to dust. "A lot of the residents are long-standing residents who have been here a long time and appreciate the fact that we are industry."

The re-opening of Porthoustock was welcomed by some local people, "They are born and brought up in that village and they view it as a working small port and I think they were quite despondent when it did shut down. When it re-opened, they were pleased" (Kent 2005 p. 4).

Truro is situated about six miles inland. It is a market town (and a cathedral town) with little or no sense of maritime heritage. On the other hand, Cornwall is a peninsula with a very strong maritime heritage and the present harbour master is trying to build on this.

'Owning' the foreshore

Interview E (Exmouth dock manager)

The language used in describing public reaction to building on a beach (at Exmouth) or digging in to a drying bank (at Teignmouth) indicate a sense of public ownership of these elements of the beach and foreshore.

Interview F (Watchet local council)

There is a strong sense of public ownership of the shore and foreshore evident from Teignmouth, Exmouth and Watchet. Certainly, in Watchet there was a good reason for local people to feel ownership of the harbour as it was built 'on the town rate' (at the expense of the town ratepayers), but the land on East Wharf was never accessible while the port was working. However, "A lot of local people didn't like the idea of houses on what they thought was public land" (Lang 2004 p. 12). At Exmouth the threat of a new quay being built on the beach meant "they would have stolen all that ground," that is, the public beach (Graham 2004 p. 4).

Interview L (Teignmouth local government officers)

Confirmation of the idea of public ownership of beaches and public spaces by the water. For example, "Exmouth didn't rate a common. The dunes and foreshore stood in" (Pawson 2004 p. 6). In Teignmouth, the Salty and the Back Beach area close to the port are regarded protectively by the public. This attitude affects the development of port land. It led to conflict between the developer and local government in Watchet and to the quashing of development at Exmouth. *This attitude can be compared with demands for access to moorland and mountains by the public: the belief that the public has rights to enjoy land that is in private ownership.*

6.2.25.1 Public Perceptions of Beaches and the Right to Roam

In England, Scotland and Wales, land is held in a freehold ownership that gives rights to the owner (within the constraints of the planning system) to use their land in any way they wish. In particular, they have been able to keep out the public and enjoy their land exclusively, fencing it in or putting up signs to warn off the trespasser (Shoard 1996). However, for hundreds of years the landless people of Britain have felt that they too have the right, not articulated in law but frequently expressed in practice, to enjoy free access to uncultivated land (Holt 1989). These 'rights' were both economic, to gather fuel, nuts and berries, and recreational, to enjoy the open air and pleasant situation. The recreational aspect became more important after the Industrial Revolution, when rural workers moved to crowded cities and sought access to the adjacent countryside in their limited time off (Stephenson 1989).

Access to open land became increasingly restricted during the early years of the nineteenth century, when the enclosure movement led to the fencing in and expropriation of common land and 'King's land'. For example, Kinder Scout in the Peak District was enclosed in 1830 and the land was allocated to neighbouring landowners. Footpaths close to towns and cities were blocked off by farmers or legally 'stopped up'. In Scotland, the Highland Clearances saw the dispossession of small tenant farmers in favour of sheep and, later, shooting estates (Stephenson 1989).

These changes to freedom of access led to the formation of associations for the protection of footpaths in York and Manchester, and from the 1840s, to the creation of urban parks as open spaces for health, exercise and recreation. Rambling became established as an activity for all classes including the urban poor and a number of local rambling clubs were formed. Regional groups of rambling clubs came together in 1931 to form the National Council of Ramblers, which became the Ramblers Association in 1935 (Stephenson 1989).

The first attempt to legalise access to open land came in 1884 with a proposed

Access to Mountains (Scotland) Bill and another Mountains, Rivers and Pathways (Wales) Bill. Both failed. The landed class held too much political power. Although arguments against access were couched in terms of economic damage to grouse and sheep or contamination of catchments for water reservoirs, there was a sense that exclusive enjoyment of land was a mark of social superiority, and rights of access threatened the very roots of power (Holt 1989). More attempts to gain legal access continued, though, alongside the gradual negotiation for permissive access for walkers. There was one notable success with the 1925 Law of Property Act that, under section 193, gave access to all common land within urban council limits. By an accident of local government, this opened up much of the Lake District to the public. Campaigning continued by the Ramblers Association and other bodies to establish a legal right of access to match the right that was felt to exist in natural justice, because land is different to other property. In other countries, it is held on leasehold from the State (Zambia and China). In Switzerland all mountains are communal property, as are most lakes, rivers and forests, and wooded land cannot be enclosed. These may be walked and climbed at will. In Spain, much of the mountain land is publicly owned. In the Netherlands the public have free access to all uncultivated land unless it is specifically prohibited, and in the Scandinavian countries there is a right to move over all land (Holt 1989).

After sustained campaigning for more than one hundred years, the people of England finally gained the right to walk across uncultivated land under the Countryside and Rights of Way Act 2000 (CROW). This uses a system of mapping access land and still allows landowners to contest the designation of their land as access land, to close it for part of the year, to restrict dogs and to bar the use of their land for horse riding, cycling, fishing etc. (2006b). It does not cover coastal land and beaches, although there is an option to extend it to these areas. Wales has no such right but in Scotland the Land Reform (Scotland) Act 2003 brought in much broader rights allowing people to cross land, including coastal land.

Sweden is often quoted as a model of free access for its *allemensräten* or Right of Public Access. This dates back to the Middle Ages and gives the right to cross all land and pick wild produce on it. It was revived in the 1930s as a mechanism to give urban workers the opportunity for recreation in the countryside. However, it did not protect beaches or access to water. This is a particular problem in Sweden because of the custom of building summer-houses on rural beaches for members of the urban middle classes. The Nature Conservation Act of 1975 gave protection to all beaches within a 100m zone while allowing local authorities to designate areas for protection up to 300m from the water. Buildings for farming, forestry, fishery and reindeer breeding were exempted (Segrell 1996).

In England and Wales it is widely believed that there is a common law right of access to the beach (see for example McCormack 1994). In fact, there is no legal concept of a right of access in English common law. The Crown Estate owns about half of the foreshore (area between mean high water and mean low water), estuary beds and tidal rivers in Britain as well as the seabed out to the 12-mile territorial limit (The Crown Estate 2004). Most of the coastline is owned by the Crown Estate, the Duchy of Cornwall (the estate of the Prince of Wales), the Duchy of Lancaster (the estate of the Queen), the National Trust and the Ministry of Defence, but the rest is owned privately. There are no clear legal rights of access to coastal lands in private ownership (DEFRA 2006b). Within planning constraints, there is no law to prevent building up to and on the foreshore where it is in private hands. With the battle for access to mountain and moorland essentially won, activists are demanding a legal right of access to beaches, foreshore, cliffs, dunes, estuaries, banks and mudflats. The public is believed to have a natural right to beaches as they do to other open spaces (The Ramblers Association 2006). The Government is presently engaged in a consultation exercise on ways of improving access to the coast (DEFRA 2006c).

What is the relevance of this material to ports? It confirms the existence of a widespread belief that the public have a right of access to beaches and open land, whatever the law says. It is a belief strong enough to force through access legislation despite entrenched private interests. This belief was described as a sense of 'public ownership' in the analysis because of such language as "the people's beach," an expression used twice, and "public beach" used once (Cardy 2004 pp. 4 and 14). Ownership is stronger than mere rights of access: it implies guardianship of a public asset. In Teignmouth, urban public spaces were described as "actually private land but used well by the public" (Smith 2004 p. 17) and "they are very protective of that space" (Smith 2004 p. 18).

This strong attitude of ownership and protection of waterside land, beaches and banks such as the Salty in the river Teign, directly affect ports through the need to gain planning consent for port and non-port development. Planning consent lies in the power of local government and the decision-making process is political as well as pragmatic. At Teignmouth, the port manager modified his development plan to allow for that factor and reduce potential opposition to his proposal, "I decided to keep the kink in the line for turning so that we don't have to dig into the Salty. Residents would not like that" (Greenwell 2002 p.11). At Exmouth the proposal for a new berth was refused planning permission because "it would have taken away as I say one of the people's beaches" (Cardy 2004 p. 4). Therefore, when formulating an application for planning permission the port developer should try to minimise the impact on beaches and open spaces, no matter who actually owns the land. Where an open space has to be developed some mitigation should be offered, to give back to the public something in return for 'stolen' land (planning gain, see below). This research indicates that the issue is stronger than one of mere access; it is a question of public guardianship.

6.2.26 Employment and economic generator effect of the port

Data relating to the primary and secondary employment generated by the port.

Interview A (Teignmouth port manager)

There are two facets to this category: direct and indirect employment by the port and the economic generator effect of the port's existence. These are in tension with the residents' desire to protect their view and their dislike of dust and lorry movements. The work itself can be unpleasant.

Interview E (Exmouth dock manager)

In 1989 Exmouth was estimated to provide about 40 full or part-time jobs, including dockers, lorry drivers, pilots, the agents, a part-time victualler (or chandler) and four prostitutes based in Watchet. It also brought wet-trade (drinking only) to the dockside pub. Employment from ports has been reduced nationally since then due to mechanisation and flexible working practices. All the port jobs in Exmouth were lost with the port closure except for the dock-master. Teignmouth was estimated to give work to about 50 people in 2002.

Interview M (Porthoustock, Dean Quarry and Truro, chief pilot)

Typically, a small port will employ 20-30 people directly as dockers, managers, administrators and mechanics. These will generally be skilled or semi-skilled, full-time, well-paid jobs. Although skill levels are not a problem, workers must be prepared to work all hours and in all weathers in a moderately dangerous environment. There is also part-time work for dockers at busy times to cope with the variable demand. Another 10-20 jobs are directly dependent on the port or ports cluster, including the harbour master and deputy, administrators, boatmen, tug crew, dock supervisors (for the shipper), agents and chandlers. These are skilled, well-paid jobs. More work is generated on an occasional basis through dredging, repair and maintenance of the structures and conservancy.

Where cargoes come from extractive industries, the port and quarry are interdependent so the quarry workers' jobs depend on the continued existence of at least one local port or wharf. The other bulk cargoes such as feed, fertiliser, grain, cement, scrap and timber will have an economic multiplier effect but this is difficult to quantify. Road haulage to and from larger ports is a viable alternative for these cargoes but it would increase costs and therefore reduce the volume of trade.

6.2.27 Regional context

Data relating to the politics and planning of ports at a regional level.

Interview B (Plymouth Cattewater harbour master)

The ports have learnt by experience that they can be neglected by the planners. "If you are talking about rail head, motorways, that sort of thing, the ports have a voice because our experience is often that ports are forgotten" (Charlesworth 2003 p. 9). They have forged a regional alliance, the South West Regional Ports Association, capable of speaking to the regional planners with a single voice. It used to be the Devon and Cornwall Ports Association but it has expanded to take in the seven counties within SWRDA. "It's been a slightly tough sort of process for us to deal with but effectively we've grasped the nettle of regionalisation, whether one agrees with it or not" (Charlesworth 2003 p. 9). There was no mention of money coming through SWRDA.

Interview N (Truro harbour master)

The South West Ports Association represents a varied collection of ports with different ownerships and interests in commercial, leisure and fishing port use. They compete in some spheres but need to co-operate in others. Bristol is not part of the Association because it is big enough to have a voice on its own. It also serves the Midlands rather than the Southwest.

6.2.28 Stakeholders

Data relating to community, business and political organisations and individuals with an interest in the port.

The stakeholders are the people and organisations with an interest in the port. They include:

- the port owner
- the port operator
- port management
- port labour
- the harbour owner
- Harbour staff including the harbour master and pilots
- port and harbour users
- the local government representatives and officers

- people living and working near the port
- people living near and using the approach roads
- residents and visitors whom the port informs their sense of place
- people working in an industry that is dependant on the port
- people campaigning on behalf of workers in the port and associated industries
- people who campaign for some aspect of the environment that is affected by the port.

Some examples of campaigning groups are Hooe Lake Presentation Society (at Oreston near Plymouth Cattewater), Sink Watchet's Awful Marina Project (SWAMP), The Teignmouth and Shaldon Environment Society, Teignmouth Action Group (trying to stop the development there) and Watchet Boat Owner's Association. Some groups are initiated by local government, such as Local Strategic Partnerships and the Teign Fishing Partnership. Such groups provide a single voice within an argument and a single point of contact for the planning authority. Partnerships provide a forum within which stakeholders can be involved in the planning and management process.

Ports need to organise and get their voices heard. They need good public relations with the local community and politicians; they need an effective voice at regional level (the South West Regional Ports Association) and a voice at national level. The need for local organisation is recognised at Truro, which has a Harbours Forum that meets five times a year to make recommendations to the local authority Cabinet about anything that takes place within the harbours. The Forum consists of eight councillors and seven co-opted members from user groups: commercial shipping, light commercial (boatyards and marinas), English Nature, local fishermen, the Royal Yachting Association, an estuary user from Truro and one from Penryn. Once a year the Forum is taken on a river trip by the Harbour Master's office to have a look at things from the water. The chair and some parish councillors from all the adjoining parishes are also invited along. "We want the citizens around here to be proud of their port. We don't want to be a burden on the General Rate Fund, we want people to come here, have a bloody good time, say yes, they enjoyed waterskiing here or they enjoyed their yachts ... and we want customers who want to use it for bringing in cargoes to be happy. We want them to benefit from this asset" (Brigden 2005 p. 20).

Secondary data: Definition of a Stakeholder

The term "stakeholder" has been defined by the DETR in the context of trust ports. It is appropriate to extend that definition to all ports because although trust ports are specifically accountable to their stakeholders, "all ports possessing statutory powers and duties should be accountable for their use as these powers were granted in the public interest" (DETR 1998 p. 7).

A brief definition of stakeholders was given in the 1998 review of trust ports (DETR 1998). They were seen as "user groups, local communities, local Authorities, trade unions and other local interests." (DETR 1998 p.14). In the document "Modernising Trust Ports" (DETR 2000b), a more extensive definition was offered. This divided stakeholders into 'beneficial stakeholders' and 'non beneficial stakeholders', the latter having only an indirect interest in the port. These are:

<u>Beneficial stakeholders</u>

- *cargo owners*
- *passengers*

- *ship operators*
- *employees of the trust/port*
- *traders with a direct commercial interest in the port*
- *their employees*

Non-beneficial stakeholders

- *local authorities*
- *the local community*
- *trades unions*
- *the Government*
- *partners, investors, lenders and creditors*
- *the national and regional economy*
- *environmental, conservation, transport and other interest groups.*

Finally, the document defines stakeholders over a temporal range as "existing, potential and future" (DETR 2000b p. 10) and compares a trust port with an heirloom, something held in trust for the future.

6.3 Conclusion

This completes the analysis of data at a categorical level concerning the working, commercial port and the issues of public and politics related to that working port. Where, through economic and other reasons a port is forced to close, new issues arise. The analysis of categories related to them is shown in the next chapter.

Chapter 7 Port Closure and Waterside Regeneration

7.1 Primary and Secondary Analysis of Categories Concerning Port Closure and Waterside Regeneration

Whereas the previous chapter concentrated on the active, commercial port, this chapter looks at the social and political issues surrounding the reasons, process and consequences of port closure. As before, it is presented by category.

7.1.1 Port closure: public inquiries and planning

Data relating to the planning process, including harbour revision orders and public inquiries, concerning port closure.

Closure or any major development of a port requires a Harbour Revision Order. If it is controversial, a Public Inquiry will be held. The new town council at Exmouth successfully called for a public inquiry into the Harbour Revision Order to close Exmouth Dock, but there was dissatisfaction with the eventual outcome except for a recommendation not to fill in the dock basin. The whole story of development, including the result, has left a feeling of bitterness and public exclusion from the decision-making process. "It's all politics, really, and money" (Cardy 2004 p. 6). There was more than one landowner (at the port or adjacent to it) and planning was piecemeal: the council had no overall vision or control. "The first application was for a marina and people thought, 'Marina! How lovely!' Six months later, he was back saying yes, he could build a marina but it would only be viable if there's some housing" (Pawson 2004 p. 3).

"The first block was going to be sheltered housing and then six months later it was, "I can't find the market for," or "I can't justify" or whatever, so out came sheltered housing and in went free-market housing." (Pawson 2004 p. 4).

"The Mayor used to tell me, "You can't do anything about it now it's all been decided." But of course at every stage when they had to confirm what they planned and alter it (usually enlarging it and making it less user-friendly for the people who were there), one could have really altered things" (Cardy 2004 p. 5).

"The local Ward Councillor ... was all for doing something about it [*the port*] but not for getting a proper planned approach" (Pawson 2004 p. 5).

The failure of local planning at Exmouth is best summed up by Mr. Pawson, Chairman of the Exmouth Residents' Association, "What could have been an absolute jewel: I think that Point is unique; and I can't deny some building might have been an enhancement, but to go the way it did, in the manner in which it went, is democratically unpardonable" (Pawson 2004 p. 15).

At Watchet the problem was, in some ways, too much attention paid to local sentiment. After careful consultation with all stakeholders and a public inquiry into the port closure, West Somerset District Council found a development partner (Dean and Dyball) and raised grant money to finance an impounding wall and a sill gate for half the harbour, to create a basin where yachts could be always afloat. Rock armouring also had to be applied to the outer part of the harbour. Because there was insufficient grant money available for the whole project, some had to come from the Dean and Dyball on the basis that they would build a residential development on the East Wharf. This was opposed by many local people and there was dissent over the mix of community and residential development. The marina opened in 2000 but in 2004, the East Wharf was lying derelict and Dean and Dyball were putting the marina on the market.

The conversion and development of port land into residential and commercial buildings offers the possibility of windfall profits to the original landowner and to the developer. It is similar in that way to the conversion of agricultural land into urban developed land and involves similar actors.

7.1.1.1 Land Conversion and the Division of the Spoils

This section examines some of the literature on the subject of converting rural land to urban land, and compares it with the process of converting port land to a marina or other non-port development.

The conversion of farmland to city land is linked to, and usually preceded by, change in land ownership. Land ownership itself is a complex tissue of motives, needs and social hierarchy. Bryant *et al* (1982) claim that "land ownership change [*is*] ... a latent force underlying the physical landscape" (Bryant *et al* 1982 p. 52). Through a process of transformation, the land moves from predevelopment owners (the farmer or non-farm resident) to intermediate actors (builders, developers, investment companies) to the final consumers of land, the households, firms or institutions that buy the developed freehold. The *motive* of the pre-development owner is to use the land in its undeveloped state, although it may have been acquired with an eye to eventual profit taking through sale. What then occurs is the exertion of pressure to sell on the predevelopment owner. The owner may choose to ignore the pressure, to hedge and wait for land values to rise further or to sell and either move out of agriculture or reinvest further into the rural landscape. The chosen path of action depends crucially on the motivation of the landowner.

From the pre-development owner, land passes to an intermediate actor. This may be a speculator: a variable group, including those who farm on part of an estate while developing the rest, but invariably perceived as undesirable. Alternatively, it may be an actor who adds value to the land by the assembly of small parcels, by gaining planning permission, by laying services or by erecting the final buildings. Land may pass through several owners, each with their own motivation and each effecting some kind of transformation to the land or its market value. The final consumer is the actor who buys the transformed land.

In addition to the primary players, Bryant *et al* (1982) identify secondary agents involved in the transformation process. These are the planners, politicians and service providers who may all seek to gain from the transformation process.

Drawing on the work of Bryant (1982), Bryant *et al* (1982) offer a conceptual diagram of the process of rural land conversion. With very few changes, this can be adapted to show the process of port land conversion (see figure 7.1). In the case of port land conversion, the predevelopment owners are the port owner, either private or local authority. The pressure for change comes from the loss of viability of the port, on the surface because of the cost of repairs or the insolvency of the port operator (although the underlying factor will be a change in the external environment, such as the ending of the Dock Labour Scheme, a change in taxation regimes or a change in ownership requiring higher levels of profitability). The intermediate actors and secondary agents remain the same as for rural land conversion. Second-home owners have been added to the final consumers, as they are significant purchasers of waterside homes in the Southwest.

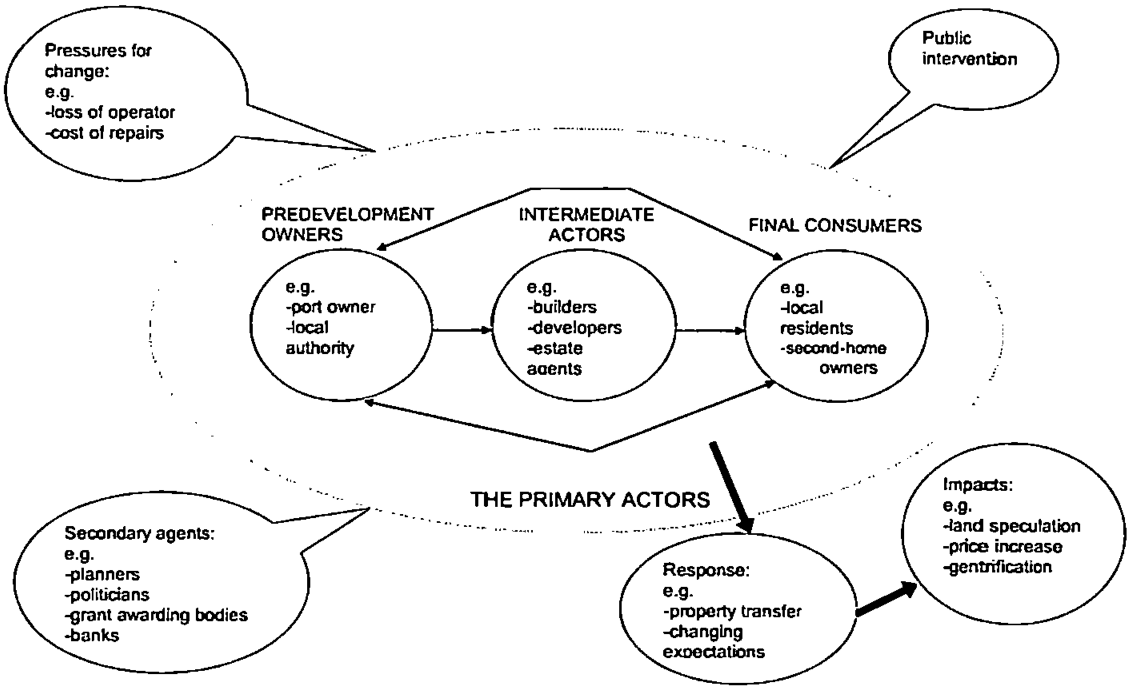


Figure 7-1 Conceptual diagram of the process of port land conversion (based on Bryant 1982 in Bryant et al 1982 p. 53)

Bryant *et al* (1982) examine the concept of land value (more correctly seen as a bundle of values in land, especially within English law). They identify the factors affecting land value as *external* to the land and its owner, such as the economy and the institutional framework, *specific to the property*, such as its size, situation and zone or planning consents, and *specific to the owner* such as expectations and market knowledge. Within port land, the state of the economy affects the level of trade through a port. It also affects demand for leisure developments but the port is probably more sensitive to an economic downturn.

An important aspect of the institutional framework is government policy towards small ports, expressed through grant aid and planning guidelines. Examining factors specific to the property, port land by definition will be waterside land and therefore desirable. If neighbouring land is residential in nature, this will increase the value of port land for residential development, whereas land situated in an industrial district will be less desirable. Within the English planning system, perhaps the most important factor affecting land value is the actual or potential planning consents for development (Evans 2004). The factors specific to the owner (such as finances and attitude to risk), for rural land, appear to have no more than a short-term effect on the land value (Bryant *et al* 1982, Evans 2004). They may however, be crucial to port land development, or rather to the earlier stage of keeping open or closing a small port under pressure. A private port owner is seeking to maximise the return on his capital. A municipal port owner has a fiduciary duty to all ratepayers and must obtain the best value for its property. A trust port, on the other hand, has a duty only to port users. Unless it is privatised, its motivation should be to keep the port open so long as it is solvent.

The existence of an effective system of planning controls results in different values for undeveloped land with and without planning permission (Evans 2004). This is true, whether the proposed development is port-related or housing and retail. The value of land within a port area depends very largely on the profitability of the port. There is also a temporal question: port land with planning permission for a retail development can be sold off to realise an immediate gain, whereas the value of the land within the port depends heavily on future port profits. These observations point up the complexity of the whole issue of ports and land. Within the context of this research, it can be broken down into three areas of interest:

- The successful port, which needs to acquire undeveloped land to expand (for example, Teignmouth needing to buy part of Polly Steps for its recent wharf development)
- The marginal port with vacant land that could be sold off for a retail or housing development or could be used for storage for a new customer (an example

given by Brigden (2005), referring to a port outside the research area)

- The failing port with vacant land that could be used for development (Exmouth and Watchet)

In each case, planning permission is needed to complete the transaction and realise the difference in land values before and after development. The planning permission itself then becomes a commodity with a value equal to the difference in land values, minus transaction and development costs (Evans 2004). It lies within the gift of the planning authorities and cannot be bought in an open market, but the value will be divided up by the various primary and secondary actors identified above, as well as by central government through taxation on development land gains or capital gains. The principal beneficiaries will be:

- Central government, through taxation
- The original landowner, who makes a gain from selling the land
- Intermediate (speculative) owners, who take risks and may have the costs of gaining the permission
- The developer (may also be the original landowner), who makes a gain from the process of development and the residual increase in value after the other beneficiaries have taken their spoils
- The local authority, within which individuals have an incentive to make gains from cronyism, vote buying and corruption, but the authority as a whole can make a 'planning gain'
- Intermediate agents such as solicitors, estate agents and planning consultants. Their fees partly represent transaction costs, but a large part will be 'premium seeking expenditure' (see below)

Planning gain is the colloquial term for the agreements that a local authority may enter into, under the 1971 Town and Country Planning Act and the 1990 Town and Country Planning Act, Section 106 (Evans 2004). These agreements allow the local authority to require payment for, or the carrying out of, some community benefit by the developer. A port does not need planning permission to carry out permitted developments within the port itself. It does need a Harbour Revision Order to undertake any work on or below the waterline. As the law presently stands, if even a single objection is made to the proposed HRO, a public inquiry must be held. This gives considerable power to anyone who will be affected by the development, including the local authority. Teignmouth District Council registered a holding objection to the Teignmouth Quays Harbour Revision Order 2004 with respect to six recommendations. The objection was withdrawn when the recommendations were accepted by the port and legal agreements entered into. Recommendations one to four concerned mitigation of the environmental effects of the work. The remaining two concerned the Polly Steps area, a public slipway reached through the port. The Council asked for a traffic management scheme to safeguard the public, and a package of works to mitigate the loss of land and improve the facilities at Polly Steps (Teignbridge District Council Executive Committee Minutes 2003). This was, in effect, planning gain.

Premium (or rent) seeking expenditure, is the money spent on lobbying and persuading the planning authority to grant the planning permission (Evans 2004). For port developments this includes, for example, the preparation of an Environmental Statement, the cost of testing the sediments for contamination, and finding some way of disposing of contaminated silt, as at Falmouth (see below). When a public inquiry is held, the port will have to prepare and present evidence. ABP's failed application for an HRO at Dibden Bay, Southampton, cost the port group £45 million (Newsquest Media Group 2004).

7.1.2 Port closure: how and why

Data relating to the reasons for and immediate aftermath of closure

Watchet

Interview F (Watchet local council)

The port was owned by the West Somerset District Council but operated solely by Watchet Marine Ltd., a subsidiary of C.M. Willie and Co. Ltd. Watchet Marine claim to have been "struggling definitely through most of the eighties" (Lang 2004 p. 4), although there was still a fair volume of trade. The abolition of the dock labour scheme in 1989 and the privatisation of Bristol harbour in 1991 lost Watchet its only competitive advantage. In 1993, Watchet Marine went into liquidation. That it lasted so long is reported to be because "Charles Willie claim that .... perhaps they ought to have done that previously but they rather liked Watchet" (Lang 2004 p. 2). The District Council immediately tried to get a new operator for the port but although there was some trade, no one, including the Council, wanted to operate the port. Consultants were employed to look into the future of the port and they stated that it was commercially unviable.

Watchet had everything (except public support) against it. "All the trends were going the wrong way for Watchet" (Lang 2004 p. 7). The negative factors were poor road links and a poor geographical situation for cargo generation, tidal restrictions (according to the consultants, although no other respondent has mentioned this as a problem), the bottom drying out fully, ships getting bigger (a factor, according to the consultants, but Watchet could take quite big ships) and the cost of dredging and maintenance as reflected in uncompetitive port charges.

Dredging was carried out with a tractor at low water with the spoil presumably dumped in landfill: a more costly option than dumping at sea. Despite high port charges, Watchet was still losing money.

Once the consultant's report said there was no market for Watchet, any investment to keep the port going was out of the question. Nor was there the management structure for a dynamic, risk-taking approach. The harbour was owned by the West Somerset District Council and run by the Technical Services Committee. They wanted an operator to take it off their hands, one way or another, and they wanted it to generate money, not cost money.

When Watchet was working, it imported and exported general cargoes including waste paper and cars. In that way, it was different to the bulk ports of Teignmouth, Victoria Wharf and Exmouth. Watchet had no geographical advantage as it lacked a large urban population nearby; and good transport links. There was no core cargo either, except possibly the waste paper. The only advantage of the port was efficiency, twenty-four hour working and high service levels. Service is important but it needs to go *with* geography, not against it. The labour force had been significant in number but fell towards the end. The only other significant industry in Watchet is the paper mill, still open, but that is served by lorry. The competitive advantage of the mill is the quality of the local fresh water.

Interview H (Watchet harbour master)

The owners of the port of Watchet (the district council) were re-active, dependent on the advice of consultants and captive to public opinion. They could not 'think outside the box'. The consultant's advice was flawed in many respects. They claimed, "Operators cannot accommodate vessels being restricted to limited times of access and leaving harbours by large tidal ranges." This may be true of the break-bulk and containerised trades but there is no evidence so far that tides are a problem on the coast today in the bulk trades: they are part of the nature of coastal trade. The increase in ship size was also a key factor according to the consultants, but Watchet could take ships up to 95m in length, which is large by coastal standards. The fact that Watchet dries was also mentioned as a negative factor. This is supported by the evidence from Teignmouth, but ports where ships take the bottom, as with Teignmouth, or which dry completely, as with St. Sampson on Guernsey, still operate.

It is possible that a more proactive management could have kept the harbour going as a bulk harbour or as a fishing harbour but there would have been a loss of public support. The harbour was uncompetitive for break-bulk and containerised trades for the following reasons:

- competitor ports were equally efficient but with better facilities
- maintaining the old harbour structure and dredging the silt with tractors made the harbour too expensive for its dues to be competitive
- the cost of road transport was too high, because Watchet has poor road links and is too far from the motorway and commercial centres.

Exmouth

Interview E (Exmouth dock manager)

In 1989 a survey was commissioned on the dock, which reported that the dock walls were too weak to support the weight of the cranes used for loading and unloading ships and lorries. Exmouth was instantly closed as a working port. It should be noted that 1989 was also the same year that the dock labour scheme ended and scheme ports were able to liberalise. Up until the point of closure, Exmouth dock was very successful with 620 ships through in the last trading year, but the end of the scheme meant the loss of competitive advantage for small non-scheme ports.

Some time earlier, plans to build a deep-water berth capable of taking 3,000dwt ships were refused by the local planning authority. Repair of the dock structure was said not to be commercially viable (especially under the new external competitive environment), so the only alternative for the landowner was to fill in the dock or convert it into a marina, and to find alternative uses for the port land (which was owned by the port operator, not the local authority). After some years of lying derelict, the dock was turned into a marina and apartments were built on the land.

Interview K (Exmouth resident within the new development)

Closure of the port was abrupt and without warning. It was 1989: the port was reported to be losing money with the end of an EU grant, the latest development proposal had been blocked and the dock labour scheme was ending (Exmouth had enjoyed the advantage of being a non-scheme port). When a survey deemed that the dock walls were unsafe to support loaded cranes, all shipping was stopped at once. There was neither the will nor the money to ensure a commercial future.

Geographically, Exmouth was well placed, close to Exeter and the M5 going north and the A303 going east. There was a railhead close by so a rail link could have been developed with a Freight Facilities Grant (had that been available at the time). The County Council did pay for a new approach road, Langerwehe Way, which greatly improved access to the port through the town.

The greatest problem for Exmouth was the close proximity of the port to residential areas and the dust nuisance from the bulk cargoes. The prevailing wind in England is from the South West and in Exmouth this would blow off the sea, across the dock to the houses. Coal, fishmeal and potato chips (waste from making crisps for human consumption, which is sold as a high-energy animal feed for cattle and sheep) are all dirty, dusty or smelly cargoes. Grab unloading from the ships with subsequent dropping of the cargo into open wagons would exacerbate the dust problem. In addition, the lorries created noise, traffic jams and spilled some of their load when they hit a curb: all a nuisance to the residents. The District Council was making complaints about the dust but measures to reduce it would cost money. Scrap exports were another unpopular cargo, being unsightly in storage and noisy to load into ships.

Exmouth also suffered from the usual problems of small ports such as restricted sea access. This could have been overcome by building a quay outside the dock to provide an 'always afloat' berth for 3,000dwt ships. It seems that a series of planning applications were made during the 1980s but these were refused because the port was unpopular, development would 'steal' a public beach and it was seen as a land grab for eventual residential use. It should also be noted that the area is exposed to occasional extreme bad weather.

Port Closure: theoretical memo

Interview E (Exmouth dock manager)

Small ports do not stay still. Either they close or they keep pushing all the boundaries with improvements and changes to storage, berths, I.T. systems, land etc. Seven key factors in the success or closure of a port have been identified, as in table 7.1.

Close	Expand
▪ No primary cargo	▪ Dependent primary cargo
▪ Poor road links	▪ Good road links/direct supply
▪ High cost of dredging	▪ Low cost of dredging
▪ High cost of repairing/maintaining dock structures	▪ Low cost of maintenance
▪ No local political support	▪ Strong local political support
▪ Reactive management	▪ Proactive management
▪ Land can be sold by the operator	▪ Land cannot be sold by the operator

Table 7-1 Key factors in port success or closure

Where the majority of the factors are negative, the port will close. The loss or absence of a primary cargo is probably the most important factor, but the sample of ports is too small to allow for the calculation of any weighting of the different factors. Port closure has a hidden cost in the loss of revenue for conservancy.

Good levels of cargo activity are not enough to guarantee the continued existence of a port. Both Watchet and Exeter were 'very busy' right up until closure. A port, like any other small to medium sized business, has to be profitable in the end. It needs investment, space, good road links, good management and innovative behaviour.

Secondary Data: Closure at Dean Quarry and Yelland Oil Terminal

The slow process of re-opening the old power station jetty at Yelland in North Devon is detailed below. However, there is a second, larger jetty at Yelland, built in the 1950s by BP and ShellMex to supply oil products to the Yelland oil terminal.

The oil jetty was closed by Texaco in January 2006, when the mv Breaksea *was the last tanker to deliver oil by sea. Future deliveries to the depot will be coming in by road from Plymouth. It was reported that the shallow water at the jetty meant that only small ships could berth and this was now uneconomic. This was reported as the end of shipping for the river Taw (Harman 2006, North Devon Journal 2006).*

Dean Quarry is at St. Keverne in Cornwall on the Lizard Peninsula, just south of the West of England Quarry (see Porthoustock, below). It is served by a small jetty but also uses road transport to take out the quarried stone. It has been worked as a quarry since the end of the nineteenth century, although the quarry was inactive during the early twentieth century. L.G. Tom and Co. started quarrying again in 1946 and shipped the stone to the London market. It passed through various owners until it was bought by RMC some time after 1982. By 2003, Dean Quarry was reported to be shipping out 20,000 to 30,000 tonnes of rock a month, although bad weather could stop ships berthing and affect shipments (Newsquest Media Group 2003). It also broke into the rock armour market with a contract to supply very dense rock for repairs to Ramsgate harbour (Symes 2003). The quarry employed 23 people (BBC News 2005).

RMC was taken over by the Mexican company Cemex early in 2005 and in May 2005 there were warnings of closure "to improve profitability" (BBC News 2005 n.p.). The quarry closed in June 2005 with the loss of fifteen jobs (Western Morning News 2005). The closure had further economic effects because of the loss of pilotage income to Falmouth Harbour Commissioners: Dean Quarry movements provided eight per cent of income (Newsquest Media Group 2005). Fears were also expressed that the loss of trade from lorry drivers would affect the *village shop in St. Keverne (BBC News 2005).*

7.1.3 Port Reopening

Data relating to the reopening of a dormant port/wharf

Porthoustock reopened after it was bought by a new company, a local quarry that wanted an outlet for their stone.

Secondary Data: Porthoustock

The village of Porthoustock lies at the head of a small cove just north of Manacle Point on the Lizard in Cornwall. On the north side of the cove, an ugly concrete loading pier used to service quarries that are now closed, where stone was loaded into sailing barges for local distribution. On the south side of the cove lies the West of England Quarry, which was serviced by a short concrete quay. The quarry dates back to the 1890s but it closed in 1978. Captain Gordon Kent took the last ship out before closure (Newsquest Media Group2006).

The quarry and jetty were bought by Aram Resources Plc., a very active quarrying and wharfing company (it had floated on the Alternative Investment Market in 1997 at 100p a share), in 1998 (Associated New Media 2000, Business.com 2000). Aram owned four quarries in Cornwall (West of England, Tregunnon, Carnsew and one other) and six wharves including the one at Porthoustock, Woolston in Southampton, Portland and Plymouth. It invested in a £2 million new aggregate terminal and plant to coat roadstone with bitumen in Southampton, and had permission for another roadstone coating plant at Plymouth (Barnicoat 1998). After obtaining European Union grant money to extend the jetty to 61 metres (Kent 2005) , the West of England Quarry re-opened on 28th August 2000 (after 22 *years) when Captain Gordon Kent piloted in the mv Malone to load 1,450 tonnes of road stone (Western Morning News 2000b). In 2000, Aram Resources was sold to the French mining and construction firm Colas at 300p a share in a deal worth £12.7 million (Business.com 2000). Aram Resources is now the quarrying subsidiary of Colas (UK) and the West of England quarry remains its most important source of aggregates and rock armour (figure 7.2) (Colas 2006). In March 2006, the quarry was reported to be shipping out 12,000 tons of stone a month (This is The West Country 2006).*

Figure 7-2 West of England Quarry and jetty

Source: Colas 2006

Yelland was bought by the Victoria Group, which wanted an outlet for clay from North Devon in competition with Bideford.

Secondary data: Yelland Quay

Yelland is a small village in North Devon, near the river Taw. There is a confluence of the Taw and the Torridge (on which the port town of Bideford sits) just downriver from Yelland, at the shipbuilding town of Appledore. There used to be a coal-fired *power station at Yelland, serviced by a jetty on the river Taw (figure 7.3). The power station was closed many years ago and the buildings pulled down, leaving an industrial site of contaminated ash beds and an unused jetty (Devon County Council 2000). Victoria Wharf bought the old power station jetty in about 1998, with the intention of cleaning up the site and building a facility for exporting clay from the North Devon Basin. This clay currently goes out through Bideford, but that port suffers from the usual problems of a congested site, tidal and size restrictions (Western Morning News 1999).*

Figure 7-3 Yelland Wharf

Source: Devon County Council 2004 p.241

Provisional permission for restoration of the Yelland site and capping the ash beds was granted in 1995. Further planning permission for use of the jetty and construction of storage was granted in January 1999. There was public concern in the area about access to a right of way known as the Tarka trail and about access *to the river for recreation. Bideford Town Council was also concerned about the threat to its shipping. After public consultation a Planning and Development Brief for Yelland Quay was drawn up in 2000 by the North Devon District Council (Devon County Council 2000). The planning permission was revised in October 2003 when planning permission for the port was renewed for five years. The jetty was to be refurbished to allow ships up to 2,400dwt to berth and four storage sheds to be built. These would be a buffer store for the ball clay (Devon County Council 2004). Very little happened until May 2006 when an application to vary the planning permission for the storage facility was put in by Victoria Wharf. This was approved by the District Council who recommended it to the County Council for approval (North Devon District Council 2006).*

7.1.4 Port closure: miscellaneous

Data relating to the multiple socio-economic issues after a port has ceased trade or closed.

After the Closure of Exmouth

Interview E (Exmouth dock manager)

A working port pays for the conservancy of the approaches and river system. The higher the fees that are paid by a working port, the more the conservancy authorities can do in terms of dredging and upkeep. Port closure results in the loss of commercial port fees and this may not be made up by fees from leisure craft. The upkeep of the river Exe is now a financial liability for the Exeter Town Council, which is trying to pass on the liability to a Trust.

Interview K (Exmouth resident within the new development)

At the time that Exmouth docks closed in 1989 it provided work for about 40 people. Had the docks remained open this would undoubtedly have shrunk to about 25 or 30 people, which is the figure for comparable ports. Nonetheless, there was a significant loss of employment for a small town. In Watchet the District Council was very concerned with economic regeneration and a planned approach that took account of all stakeholders. In Exmouth there was nothing: the land owner put in piecemeal development proposals and the local council reacted to them on a case-by-case basis until a public inquiry into the port closure was demanded. That enquiry looked at the docks: it was not about regeneration and planned development.

There was no overall plan for the re-development of the port that could be presented to the public. The dock owner wanted to maximise his return from the land with a high-density development. The local authority (and especially the Town Council) lacked the expertise in managing a large development from the planning point of view. Employment could have been generated from development that was more commercial but that would have been in conflict with the needs of largely retired residential buyers. The result was very little employment, a high-density development which is unattractive to the town's residents and reduces their access to the beach, and which caters to second homeowners and the retired. The eyesore of a derelict dock has gone but Exmouth has gained very little in exchange.

Interview N (Truro harbour master)

When the port closes, what is lost is:

- port jobs: the dockers, harbour master etc.
- sense of vitality and expectations of growth (leading to investment)
- second tier jobs such as truck drivers, prostitutes and chandlers

- harbour income to keep up the conservancy, this has an effect on leisure boating
- the visual impact of ships

The purpose of redevelopment is:

i. for the landowner: to "cash in" the land for residential development
ii. for the local authority: economic regeneration and optimism leading to investment and jobs
iii. for the community: to get rid of the eyesore of derelict docks and wharfs, keep links to their maritime heritage and access to the water for recreation.
iv. for the harbour authority: someone to pay for conservancy.

7.1.5 Port closure: the marina

Data relating to the conversion into a marina of a port that has been closed to commerce.

Interview F (Watchet local council)

When a port closes there is a loss of vitality to the town " There was nothing apart from the water coming in and the water going out" (Lang 2004 p. 8).The council had to make the harbour profitable (or at least self-funding) and active again and that required a move to leisure and tourism. The choices were a 'historic harbour' concept (as at Charleston) or a marina, and the marina could be run by an operator. Conversion to a marina (with all Watchet's physical problems) would cost a great deal of money but there were grants available (although not as much as was originally hoped) and there was land on the East Wharf that could be developed. The final solution required impounding about half the harbour area, but only enough to keep yachts and small boats afloat (See figure 7.4).

Figure 7-4 Watchet Marina and Half-tide Sill

Source: The Author 2004

Interview H (Watchet harbour master)

The marina at Watchet suffers from a number of problems. It is tidal, so boat owners are not free to come and go as they please. It still silts up, so there is the cost of dredging to cover. There is no housing associated with the marina and few facilities. The empty East Wharf is unattractive and there is disagreement over its development. On the positive side, the marina has brought life back to the empty harbour. There is some evidence of increased tourism, increased jobs and more upmarket pubs but these things may have happened anyway as the UK has enjoyed a prolonged period of economic prosperity since 1993. The full benefit of the harbour conversion to leisure use will not be felt until the East Wharf is developed to the satisfaction of at least most of those involved. That is proving difficult to do at present.

Converting to a marina: Theoretical memo

When an economically unviable port is converted into a marina it retains many of the problems that caused the port to fail in the first place. These include tidal access, silting, narrow entrances, costly repairs and maintenance to the infrastructure and exposure to bad weather as well as poor road access. There are also new problems of mixing commercial and residential development and the provision of facilities such as boat storage and sewage pump-outs. A successful conversion requires considerable investment and a complete plan that balances the needs of boat owners, residential development (to maximise the return on the value of the land) and commercial development to provide employment and meet the needs of local people. If either the landowner or the local residents are given too much control over the development the result will be infelicitous.

Interview J: Exmouth Marina

It is reported that the last owners of the commercial dock at Exmouth always kept the possibility of conversion into a marina in mind (Graham 2004 p. 3). The family are involved in the leisure business through ownership of the Ladram Bay Holiday Centre in Budleigh Salterton. After closure of the commercial dock, the area was left derelict for some time and then a planning application was made for conversion to a marina. This was followed by a series of planning applications for building. There was no overall plan that was made public and no public consultation over this major urban redevelopment scheme.

Conversion to a Marina: Attitude of Residents

Conversion work on both Exmouth and Watchet marinas began several years after the last operator ceased work at the port. In both cases, there was public support for the conversion: "particularly general support for the marina because they didn't like the option of nothing happening, nothing else" (Lang 2004 p. 11). "... the first application was for a marina and people thought, 'Marina! How lovely!'" (Pawson 2004 p. 3). As they developed, opposition grew to both schemes. A Public Inquiry into the Harbour Revision Order was held both at Watchet (in 1999) and at Exmouth (in 1997). At Watchet, despite extensive consultation, "we actually had to go through a very hard fight" (Lang 2004 p.12). There people wanted to keep open the possibility of a commercial port. At Exmouth there is a belief that "You could still operate the docks and use clean cargo" (Cardy 2004 p. 14). In addition, opposition to the marina was bound up with opposition to the development of the land, especially, in the case of Exmouth, development that affected the beaches and beach access, "ignoring the people's view that this was a public beach and there were rights over it" (Cardy 2004 p. 14). There is also the sense that the old dock *should* be in public hands, "what we're desperate for is to retain as much as we can for a democratically owned or run facility" (Pawson 2004 p. 12). The marina users at Exmouth seem to be happy with the facility for their boats, "The marina is fine except for the race across the entrance" (Smith 2004 p.1).

7.2 Conclusion

The analysis of categories in the preceding two chapters was based on the interviews with various stakeholders at the ports of Teignmouth, Plymouth Victoria Wharf, Exmouth, Watchet, Porthoustock and Truro. Some theoretical ideas were developed during the process of analysis. In addition, various applications of theory from associated areas were made or analogies drawn from theoretical concepts in other disciplines, to aid the process of theory formation.

Chapter 8 Conceptual Analysis and Discussion

8.1 Introduction

This chapter uses a classic device of qualitative research to complete the analysis at a conceptual level, by telling the 'story' covering all aspects of the findings. The story comes in four parts, relating to the three concepts found in the analysis and the concept of ports and regional competitiveness that formed the starting point for the research project. Key findings within the narrative are emphasised with the use of **bold type**.

A discussion follows the conceptual analysis. This focuses on the original contribution of this research to knowledge about small ports and wharves. Issues of validity and reliability are explored in terms understood by the founders of the method and in terms that are more conventional. The question of whether the findings can be generalised to other ports and other areas is discussed, which leads into proposals for future areas of research.

8.2 The story

8.2.1 The Commercial Port

Small ports in the Southwest are monopolistically competitive. They have no exact substitutes, but close substitutes for the port are neighbouring small ports and larger ports further off.

According to much of the theory reviewed in chapter two, large ports expand their hinterland into that of small ports, leading to the decline and inevitable death of small ports. Nonetheless, small ports exist and thrive in their modest way. To explain the success of small ports in the Southwest, a new theory (applicable to the Southwest) has been generated from this research, which the author has called the ***ecological theory of port competition***. This theory, which was developed in chapter 5 from primary and secondary sources of data, is summarised below.

Every port is unique, with a different history, geography, location, connections, demand conditions and physical hinterland. A port succeeds because it is adapted to a market niche within which it enjoys a unique competitive advantage. Within that niche, the port faces limited competition and may flourish and grow to the limits of its natural capability if the operator is commercially astute. The combined physical and demand conditions of the port set the limits of natural capability – a port in a physically poor situation will grow quite large if it sits astride a strategic route, as Dover does, although it will never be a mega-port, and an ideal deepwater harbour on a strategic route is wasted if, like Falmouth, the demand conditions are lacking. If both demand and depth of water are small the port will remain small, but it will not wither and die under the shadow of the giant port nearby. Instead, like the bluebell under a beech tree it flourishes in a strictly limited way.

The small port is extremely vulnerable to small changes in the external environment. These can be changes in taxation, supply or demand of its primary cargo or changes in national policy. To survive such a change the port needs a ***refuge from competition***: a period of cross-subsidisation from a parent company or from other activities in the port area. Without such a refuge it must quickly close. Even with a refuge it may still fail in the end if the commercial drive is missing.

Within its niche a small port may be a monopoly provider of port services. The niche is related to port facilities, parcel size and local geography. The shipper wishing to send or receive goods in the Southwest will be dealing with a certain quantity of goods, depending on the needs of the final customer(s) to do with handling and storage, level of demand for the final product and size of the foreland port. If the parcel size is large, economies of scale will normally dictate a large-port-plus-road combination. If the parcel size is small then economies of scale are lost and long road haulage may become uneconomic, especially for bulky, low value goods that are not time sensitive. The choice then lies only between those local ports with the facilities to handle the cargo. If there is a choice, it will be dictated by total supply chain price, but there may be only one port within the economic area capable of handling the cargo. ***This port is a local monopoly and price now dictates quantity***, depending on the elasticity of demand (see figure 6.10). Demand for port services is generally said to be inelastic, especially for bulk cargoes (Haralambides *et al* 2001). However, profit margins are also low in the dry bulk sector so too high a price will simply lead to the cargo not being exported or imported. Likewise, if the port closes then the extra cost of road haulage to or from the nearest port could end an export or import trade. What is lost then is the entire suppliers' and consumers' surplus from that trade, an economic loss to the region. Small ports, like other small businesses, can provide a high level of customer service and build a relationship with the customer. ***The availability of different ports is important because it maintains the diversity of economic activity within a peripheral community.***

The niche for very small commercial ports in the Southwest is non-time sensitive, low value, low profit margin dry bulk cargoes and some bagged and palletised cargoes of the same type, as well as bulk oil cargoes at a few ports. A typical port will have one or two core cargoes. The port and the shipper are interdependent (symbiotic), although a large shipper may deliberately use more than one port to introduce competition and keep the prices down and the quality of service up. ***The port uses niche or concentrated marketing to attract new business***, for which the internet is particularly useful (Brigden 2005, Armstrong and Kottler 2007).

One advantage of any small business is that it can provide a high level of customer service and build a relationship with the customer. Small ports work on a personal relationship with their customer, but in the animal feed sector they also have a relationship beyond the shipper, with the animal feed compounders who buy from the shipper. Such an extended relationship will probably exist in any trade where the shipper only buys and sells the cargo and the end-user collects directly from the port. The relationship is made stronger in the case of animal feed because of the stringent hygiene and traceability requirements now in place for animal feedstuffs. In turn, this strengthens the interdependence of port, shipper and feed compounders. It increases the importance of the local port to the creation of social capital and imbeds it more firmly into the rural economy.

Because of the dependence of the port on its core cargo it will do nothing that might risk the loss of the cargo to a competitor. Both china clay and animal feed have stringent cleanliness and hygiene standards and do not mix well with such things as scrap metal or vermin. ***However, when a change in the external environment results in the loss of a core cargo it provides both a threat and an opportunity.*** The threat is the loss of profitability. The opportunity is the chance to accept new cargoes on the land released by the core cargo. This is also an opportunity for local business to engage in new areas of export and import. The port of Par is now facing this threat and opportunity.

There is concern about the renewal of ships in the coastal fleet. Economies of scale have led to an increase in ship size in all sectors because, where demand exists, a shipowner can make more money out of fewer, larger ships than he can from more, smaller ships. On the other hand, demand does exist and will continue to exist for the shiploads or parcel sizes of 1,000 tonnes to 3,500 tonnes. This is a niche market within which some shipowners are said to operate because it pays a freight premium (more money per tonne of cargo carried). One hope for new shipbuilding lies within the river-sea fleet. A new generation of ships of about 1,500dwt was built in the 1990s and the sector is thriving. The European Union is actively engaged in encouraging the improvement of inland waterways and short sea shipping in general, although not in the bulk shipping sector. The British Government, on the other hand, is aware of the small ports sector through the Department of Transport's work on trust ports and municipal ports, but seems not quite sure what to do about them. One problem with new coastal shipping is that owners are said not to be prepared to let their ships take the ground when alongside, nor are some of them willing to accept stone or aggregate cargoes. Finally, river-sea ships, being long and thin, do not have the best sea-keeping qualities needed to face the Atlantic and North Sea coasts in winter, although research and development continues in this area.

A port, of whatever size, cannot stay still. In a dynamic world the 'do nothing' option is death, if only because the wharf is being attacked by accelerated low-water corrosion. The dynamic, modern, small port must invest in infrastructure and storage. Storage can be justified on commercial grounds because it is the source of profit, but infrastructure alone has a payback period well in excess of the ten years required by port businesses in the UK. Ideally, a new development involves storage as well as a new wharf (as at Teignmouth), otherwise social funding is needed, justified by lorry-miles saved (with a water freight facilities grant), flood defences or some other social criteria. It should be noted that, where a port is a local monopoly within its niche, there exists a public good argument to provide the mechanisms of funding and governance (for example, subsidy and trust port status) to keep down port prices. This argument is based on supporting export industries by reducing transport costs. The subsidy lowers the port costs and the public ownership (theoretically) prevents rent-seeking behaviour by a private monopoly owner. Trust port status also removes the temptation for short-term profit maximisation behaviour by a private owner, especially when it comes to a choice between costly but sustainable repairs on the one hand, and cheap temporary patches to the fabric of a port or closure and sale of the land. However, the type of ownership (trust, municipal, private or mixed) appears to matter less to a small port's long-term success than does the institutional framework around the governance of the port.

Dredging is an important issue for small ports because it is a significant cost both in the daily running of a port and for any port development on or below the waterline. The amount, frequency and type of dredging needed by a small port is part of its natural endowment, but for many ports it is essential to be able to dump the arisings from dredging out at sea in a spoil ground. The bureaucracy of consents, environmental statements and dredging protocols all add to the cost and difficulty of the operation. On the other hand, the UK has national and international environmental obligations to be met. Where possible, the bureaucracy needs to be streamlined, but it may be more important for small ports (especially those without a parent company to offer expertise) to have access to advice, experience and best practice in dealing with the issue.

8.2.2 Public and Politics

Public perceptions of the port towns in the study were varied and seemed to have little effect on the success or otherwise of a port. The identity of Watchet was intimately tied up with its port, but economic (and to some extent institutional) factors led to its closure. The people of Exmouth deeply disliked their port, seeing the town as a seaside town, but that port closed due to economic factors. However, had there been a different institutional framework there it is possible that a new quay could have been built outside the dock and the port could have continued trading. It enjoyed a strong geographical advantage. Teignmouth has a mixed identity, partly port town, partly seaside town, but a strong institutional framework to support it. Plymouth has a maritime identity and the Cattewater has an industrial and working class past, although parts of it are now being 'gentrified'. Cattedown Wharves and Victoria Wharf are both subsidiaries of larger companies mainly involved with ships and ports. There are elements of a good institutional framework and the City Council and Maritime Plymouth are working to strengthen it. Truro perceives itself as a market and cathedral town but again there is a good institutional framework there. It seems, therefore, that the ***institutional environment is more important than public perception for a successful port, apart from purely economic factors***. By institutional environment is meant the support of the local authority, governance of the port, motivation of the port owner, freedom of action of the port, expertise available to the port and legislative framework around the port.

In the past, a port has been seen as 'paying for the town' through port dues and dock employment. Now, port dues may well be needed to fund further development at a port. The workforce is reduced from what it used to be even twenty years ago, with no more than 20-30 people directly employed. However, these are full time, skilled and semi-skilled jobs with extra work at busy times. In addition, there are 10-20 jobs from the harbour. ***The true economic importance of a small port lies in its interdependence with extractive industries and the access to markets for bulk cargoes.***

Small ports in the heart of a rural town create the following environmental problems:

- Lorry traffic
- Dust and airborne particles
- Noise from loading ships
- Turbulence, habitat destruction and benthic smothering from dredging
- Benthic contamination by TBT and debris
- Visual intrusion by sheds, cranes and scrap piles
- Development of public access land

Although there is a good deal of tolerance towards a working port by local people (especially if they are indigenous to the area and feel connected to the port), complaints will be made to the local council. The council has a duty to monitor the situation and may impose working restrictions on a port in order to mitigate the nuisance. Ports can help by investing in dust-free handling equipment, dredging at an appropriate state of tide and finding beneficial uses for dredged spoil. County councils may, where possible, invest in a new road approach that takes lorries away from houses and congested areas. Otherwise, residents will have to accept the nuisance, until such a time as a port applies for a harbour revision order or planning permission for non-port land. Most of the drivers for such a port development have been noted above. They can be summarised as:

- Very small ships are leaving service and new ships are longer and deeper
- Owners of new ships do not like them to 'take the ground'
- Storage
    - Animal feedstuffs must be segregated
    - Grain silo for grain exports
    - Covered storage needed for cargoes such as timber
- Repairs needed to basic infrastructure
    - Accelerated low water corrosion on steel pilings
    - Aging brick, stone or wood structures
- Part of a flood defence scheme

Local action groups and local councils have a strong say in the planning process. With the current legal framework, a public inquiry is almost certain, leading to a lengthy and expensive planning application. A port is bound to be unpopular with some people and any development will face objections. ***What appears to matter most is the support of the local council, which will (or should be) in a position to see the bigger picture.***

An important element of public opposition to port expansion is the sense of public guardianship and enjoyment of open land and beaches. People will fight very hard to preserve 'their' land and they will be very bitter at its loss. If something is to be taken away, the wise port operator should expect to give something back to ease the planning process.

Because of the importance of a local authority veto, the informed local authority will demand 'planning gain' from a port operator before giving planning consent to a land-based development or withdrawing objections to an HRO. This will normally include environmental reinstatement, sometimes compensatory (in another area), improved facilities for and access to public land, and possibly operating constraints.

Apart from transaction costs, the costs involved in securing permission for a development are known as 'premium seeking expenditure'. ***While such expenditure offers economic gains for the secondary agents involved it increases the cost of any port development and may render it unviable.*** Where permission is ultimately refused, it will be an unmitigated loss to the port, which may prevent a port from embarking on the process if it cannot be sure of success.

Because ports operate within such a political context they need to engage with the public and politicians at a local and regional scale. Truro provides a model of active engagement with the local parish and district councillors. At the regional level, the South West Regional Ports Association provides a single voice for all the different types of ports to be heard by the regional authority.

8.2.3 Waterside Regeneration

The ending of the dock labour scheme in 1989 led to the closure of both Watchet and Exmouth ports. Dean Quarry has been closed by new owners because it was not profitable enough, although it was penetrating new markets. Yelland Oil Terminal jetty has been closed because the water alongside was too shallow for the available coastal oil tankers. Presumably, dredging or building a new terminal further into the river was considered uneconomic, possibly because of the tax implications of storing oil cargoes at the depot. Oil deliveries to North Devon will now have to come by road from Plymouth. In all these cases, closure is caused by a change in the business environment external to the port and because economies of scale demand the use of bigger ships. Isolated rural wharves have the potential to re-open, as Porthoustock has done and Yelland Quay may do. Urban port land is too valuable to stay idle, however, and will inevitably be converted to commercial, leisure and residential use.

The loss of a port has some or all of the following negative consequences:

- Loss of port-related jobs, primary and secondary
- Loss of an income stream to cover conservancy costs
- Lost waterside vitality
- Lost visual impact of shipping
- Lost access to markets and suppliers for local business
- Increase in road haulage in the region
- Private development on land considered in the public domain
- Visual impact of a high-density or unsympathetic development
- Loss of social cohesion through an influx of second home owners and retirees from outside the town
- Growth in retired residents in conflict with leisure businesses

The positive consequences are:

- An end to the immediate environmental problems of dust, noise, lorries etc.
- Greater economic efficiency through economies of scale in waterborne transport
- Release of waterside land for leisure, commercial and residential use
- Scope for conversion of the port to a marina, leading to a more up-market image

- Scope for increased residential provision in the town centre, leading to population growth in the town and growth in local businesses
- The possibility of employment in the leisure and commercial sector

Conversion of port land to residential, leisure and commercial use is a similar process to the conversion of farmland (see figure 7.1). The primary actors are the pre-development owners, the intermediate owners and the final consumers. The secondary agents are the planners, politicians, grant awarding bodies and banks. The existence of planning laws tied to a specific plot of land means that the value of the land is considerably enhanced by the granting of planning consents. In economic terms, the value of the planning consents is equal to the difference in land prices minus transaction costs. This value can accrue to a number of beneficiaries but by default it will go to the pre-development or intermediate landowner. ***An informed local council, if it is not the landowner, should be able to take some of the value for the community it represents through planning gain. It should also be able to minimise or mitigate the negative effects of port closure through the use and enforcement of planning conditions***.

8.2.4 Ports and regional competitiveness

Having reviewed the recent literature on regional competitiveness (see chapter three), it is necessary to place it within the context of small ports, and especially within the context of the findings from this research. As a firm, a port is a traded business (marine transportation services), selling its port services to shippers outside the region. It is also a facilitator of traded businesses, enabling local businesses such as agricultural products, fertilisers, fish products (at Cattedown

Wharves in Plymouth), and concrete products to exist, or to be more profitable or cause less environmental damage than they would without the port. The local port is also essential to resource dependent industries such as china clay and aggregates. These are, apparently, less important to regional competitiveness than traded industries but they are more productive than local industries. In Devon and Cornwall these industries are particularly important to the local economy because there is a low level of manufacturing industry.

The clustering of related industries has been understood as important to regional competitiveness for many years. For that reason, academics have studied clusters (Porter 1990, De Langen 2002), and politicians and industry try to encourage them (Lundequist and Power 2002, European Union Commission 2006). The concept of clustering has been applied to maritime industries with the identification of an important Dutch maritime cluster (De Langen 2002) and the acknowledgement of maritime service clusters in London, New York, Singapore and elsewhere. The Irish government has included the marine sector in its Productive Sector Operational Programme 2000-2006 (Government of Ireland: Department of Enterprise, Trade and Employment 2000), funding a project to identify a maritime cluster within the Greater Dublin Region as a first step to growing it into an internationally recognised cluster (Brett 2006).

In the city of Plymouth, an organisation called Maritime Plymouth has been set up to foster the marine cluster there. The Cattewater Harbour Master is prominently associated with it, as is the ABP port at Millbay, but not the commercial wharves at Cattedown (Maritime Plymouth 2006). Maritime Plymouth is partly sponsored by Marine South West (2006), a company sponsored by public sector and industry bodies to increase competitiveness within the marine sector in the Southwest region. Another organisation is Cornwall Marine Network, which lists Falmouth Harbour Commissioners but not the Port of Truro amongst its members (Cornwall Marine Network 2006). These organisations identify active and growing marine clusters within the Southwest, but they are clusters of businesses concerned with marine leisure and fabrication, not marine transportation, storage and distribution. The Dutch government identified their marine cluster as relating to the building and operation of ships (De Langen 2002), which removes it from the marine leisure sector. In those terms, Plymouth has a weak cluster but the small-town ports and rural wharves within this study are isolated, with little to contribute to regional competitiveness. From the above it can be seen that situating small ports into a cluster by deductive methods provides unsatisfactory results. Porter (2003) used inductive methods to create clusters based on statistically significant locational correlations, although being careful to eliminate spurious correlations. Forty-one narrowly defined clusters were identified, many of which overlapped. Marine transportation services fell within the agricultural products cluster, together with fertilizers, fish products, supplies distribution and wholesaling, and transportation and logistics services. Marine transportation fell into the transportation and services cluster, which was linked with the hospitality and tourism cluster (containing water passenger services) and the IT cluster. Water freight transportation services fell into the oil and gas products and services cluster, which certainly reflects the importance of oil cargoes in domestic coastal shipping in the UK. These types of clusters make more sense for small ports and wharves than leisure or shipbuilding clusters. More research is needed in this area, however, as findings from the United States cannot be expected to be directly applicable to the situation in Southwest England.

Finally, ports may be seen as important for bridging social capital. They widen the horizons of those firms involved in importing and exporting through them and link the coastal community with industry further inland.

To summarise the small ports and wharves of Southwest England contribute to the competitiveness of the Southwest region in the following manner:

- As a successful small business in the traded sector, which according to Porter (2003) is the most important sector for setting wage rates within a region
- As a facilitator of traded businesses, improving their competitive position
- As an essential element to the competitiveness of local extractive industries
- As potentially the nucleus of a cluster of industries around agricultural products, fish products, supplies distribution, wholesaling transportation and logistics services
- As a source of bridging social capital, valuable to knowledge spillovers
- If quality of life is included in the definition of regional competitiveness, ports have a small, local negative effect but a positive effect for the region by taking freight vehicles off the road.

8.3 Discussion

The findings presented above are a mixture of new theoretical constructs, known but not previously articulated empirical knowledge and some very well known issues for small ports or ports in general.

It could be argued the "ecological theory of small ports" is no more than a particular application of Porter's generic strategy of focus. However, ports are unique as businesses because not only are they place-specific, like extractive industries or property rental, but they *must* exist on a one-dimensional interface between land and water, and serve the attached two-dimensional hinterland and foreland. Therefore each port has a combination of physical and demand conditions that limit its choices and capabilities. The port adapts to these conditions, as described in the ecological theory. The theory is specific to ports because ports are like no other businesses.

The problem with an aging fleet of very small coastal ships not being replaced, or replaced with ships over 3,000dwt, has been publicised by the Sea and Water organisation (Elsom 2006, Grey 2006a). Grey also comments that an aging fleet is not environmentally healthy and suggests that there is a need to help with the capital costs of new ships. The EU explicitly prohibits this type of state aid to short sea shipping.

The space constraints facing small ports, their need to invest in storage, the problem of financing investment and the poor uptake of water freight facility grants is also recognised, as is the opportunity for integrating ports with distribution centres in order to add value to cargoes (Elsom 2006, Grey 2006a). The environmental problems caused by ports, and the resulting unpopularity of the port with its residential neighbours, are highlighted by Grey (2006b). He also comments on the tendency for ports to be closed down or part of their land sold off for development into housing and supermarkets, and makes the point that the loss of foreland wharves hampers the growth of the short-sea sector. Grey (2006b) acknowledges that environmental pressures will have a cost for ports as they must invest in equipment to mitigate the problems. The cost and delays of meeting environmental regulations and providing compensation for lost habitats is significant, as are general planning delays.

The role played by the core cargo at a small bulk port is well known in the case of, for example, the china clay ports of Par and Fowey but it has not been articulated at a theoretical level. Likewise, the interdependence of ports and extractive industries, and the local monopoly position of a port and local industry was well understood in the past, although less so now. The value of niche marketing and of engaging with politicians at a local, regional and national level also falls into the category of empirical knowledge.

The distinctive contribution of this research is the ecological theory of port development, which contradicts accepted theory on small ports. However, the accepted theory was formed through two sources: port development in colonial countries (West Africa, Australia and East Africa), and the effect of automating the industry by containerisation. Neither source can have much relevance for modern bulk ports in Southwest England. Other new contributions are the importance of the institutional environment to the success of a small port and the key role played by the local authority. Apart from these new theories, this research has synthesised knowledge of and theories concerning small ports, port land and the whole social and economic environment surrounding them to provide important theoretical insights into the small ports of Southwest England and into the contribution of these ports to the competitiveness of the region. There is a further contribution to knowledge in the novel application of grounded theory methodology to port research.

The story, theories and general findings from this research gain their validity from the Grounded Theory methodology that was used to gather and analyse data. The process of categorising, forming concepts, drawing connections and forming theories has been presented to the reader in detail so that the steps leading from raw data to fully formed theory can be traced. The results are grounded in the data.

8.3.1 Evaluation of the grounded theory research

Grounded theory can be evaluated on the basis of fit, work, relevance and modifiability (Charmaz 2000). Fit means that the categories were developed from the data and explain the data. Although all the data fragments were labelled directly from the data, the initial categorising and conceptualisation was informed by the preliminary literature on regional competitiveness, as explained at the beginning of chapter five. These were changed as the research progressed in order to reflect and explain the data. Glaser is very clear in his later work that a dictum of grounded theory is "do not do a literature review in the substantive area and related areas where the research is to be done" (Glaser 1998 p.67). However, a research question had to be formulated and research committees generally expect some background review, as even Glaser acknowledges (Glaser 2001). Corbin and Strauss (1990) say that at the start of a research project, the researcher must have some idea of the phenomenon to be studied and this knowledge is used to select the individuals, community or organisation to be studied.

As grounded theory methodology is adopted by more and more researchers in business and technical fields away from its sociological beginnings, researchers have been publishing critiques of the method and their own practical experiences of it. Allen (2003) gives a very clear description of his actual work and problems when researching configuration management and the use of commercially available computer products. He discusses the issue of a literature review and being open to new theory, and makes the point, "there has to be some agenda for research by interview. Busy people in industry and commerce expect meetings to have an agenda and research projects to be scoped" (Allen 2003 p.8). Pandit (1996) in his research on corporate turnaround explains that the first step is to define the basic research questions by using the technical literature. In that case, or where the researcher has an extensive knowledge already of the research area, Glaser suggests making the knowledge explicit and treating it simply as more data, to reduce the risk of preconception and aid emergence of concepts from the data (Glaser 1998). Pandit (1996) took this injunction literally by conducting a grounded analysis on the technical literature. He then used the findings from this analysis to direct his theoretical sampling towards the next case. However, his research was entirely based on secondary sources rather than primary data. Glaser also suggests allowing the data and generated literature to correct any preconceptions, re-doing the literature review after the theory has been formulated (Glaser 2001). This is a time-consuming method but, so long as the researcher is open about the prior knowledge and open to the emergent concepts, it will provide a valid 'fit'. It should be noted that the literature review of ports and port theory was conducted after the concepts were formed and the theory was formulated, although there was some prior professional knowledge. It is argued that the final concepts and categories listed in table 5.1 do fit the data and the theory formed does explain the data.

A grounded theory must function and be useful to be valid. It is argued that the various theories above do "provide a useful conceptual rendering and ordering of the data that explains the studied phenomena" (Charmaz 2000 p. 511).

Phenomena concerning the closed and the successful ports have been explained, the importance of the local authority made explicit and new theory has been generated which may be tested in future research.

The result is relevant because it tells a theoretical story of actual ports and port towns. Various basic processes, such as port selection or land conversion, are explained by the findings. The results are also relevant on a wider scale of local, national and EU policy making.

Modifiability means that the theory produced by a piece of grounded research is not fixed and absolute. It is flexible enough to be changed in the face of changing conditions and new data. In this research, the various theories produced were modified up to and including the process of writing up. For example, new flood defences were suggested as a driver of port development after the last analysis, of the port of Truro, and then confirmed by the case of Bideford. The ecological theory of port competition is the core theory produced by the research, because from that flows the assumption that small ports and wharfs will continue to exist into the future, and therefore the other findings about them are relevant and important. It is a developing theory, open to modification. For example, it is not clear if the small ports and wharfs will continue indefinitely into the future or if the effect of large-port competition is simply delayed by the niche market places of small ports. Nonetheless it is sufficiently formed for the research to be drawn to a close (Glaser and Strauss 1967 p. 225).

An alternative means of evaluating grounded theory research is offered by Corbin and Strauss (1990). They state that grounded theory research should be judged by the usual scientific criteria, which is disputed by many qualitative researchers such as Janesick (2000), but these criteria need to be re-defined. Issues of validity, reliability and credibility apply to the data. There are issues about the plausibility and value of the theory, as noted above. Then there is judgement concerning the adequacy of the research process, which should meet seven criteria that are made explicit in the report. Finally, there are seven criteria concerning the empirical grounding of the research findings.

The criteria for the research process are to make explicit:

1. Selection of the original sample
2. Major categories
3. Some of the indicators of the major categories
4. The specific basis of theoretical sampling
5. Some of the hypotheses pertaining to connections between categories
6. What discrepancies were found concerning the hypotheses and how were they accounted for
7. How and why was the core category selected

(Corbin and Strauss 1990)

The first five criteria have been made explicit in chapters three and four. There were very few discrepancies between the emerging hypotheses and actual data, but where they occurred the hypothesis was modified to take account of the new information. For instance, lack of public support was felt to be a factor in a port closing. This was the case for Exmouth but not for Watchet, so it was then listed as one of several possible factors in port closure. When the final theory was being formed it became clear that the *institutional environment* was the key issue (of which public support was one facet).

There is no core *category* for this research, although there is a core hypothesis. That does not matter because:

- this is not sociological research
- a core category is not generally meaningful for business research
- the teachings of Glaser have been followed where they conflict with those of Strauss and Corbin, and Glaser does not insist on a core category

In "The Discovery of Grounded Theory "(Glaser and Strauss 1967 p. 40) the *core of the emerging theory* is mentioned but no core category.

The criteria for the empirical grounding of the findings are:

1. Are concepts generated from the data? This is similar to 'fit' above
2. Are concepts systematically related? This should be presented throughout the text of the report, not just as a list
3. Are linkages and categories well developed?
4. Is there a range of variations?
5. Is the wider environment part of and included in the theory?
6. Does the theory allow for 'process' or dynamic changes?
7. Are the findings significant or relevant?

(Corbin and Strauss 1990)

The argument for 'fit' has already been made. The linkages and relations between categories and concepts have been made explicit in the writing. Categories have been developed and explicitly defined. The variations of small ports and wharves, their ownership, closure and re-opening has been built into the theory. The wider external environment of legislative and public policy provisions has been reviewed and made part of the theory. Change or process in a business and business environment sense has also been incorporated into it. Finally, the case for relevance has already been made.

8.3.2 Theoretical sampling

Quantitative research generally uses probability sampling. Qualitative research generally uses non-probability sampling, which has the advantage of being flexible, low-cost and allowing for small samples. It has the disadvantage of not being representative. With a small population of ports and wharves to choose from, it would have been possible to carry out a saturation survey that of course would be representative. It was decided not to do this because such a survey would either have been very large in terms of the numbers of interviews undertaken, transcribed (very time consuming!) and analysed, or it would have been shallow, with only one interview at each port or wharf. The decision was taken to investigate the early cases in depth with three respondents representing different interests at each port. Purposive or judgemental sampling was used initially to select the ports, as described in chapter three. There was a certain amount of accidental and snowball sampling in the choice of individual respondents. This was necessary because, although the names and addresses of port and harbour operators are available in the public record, private individuals are more difficult to access, shippers may not be known until the port operator has revealed their names and the name of a relevant local government officer may not be obvious without inquiry of other stakeholders.

One of the hallmarks of grounded theory is theoretical sampling. By its nature, theoretical sampling is possible only after analysis has begun and a certain amount of theory has been generated. Although a tentative plan of ports to be sampled was made at the start of the research it was abandoned partly through non-response from Par but also because Par was yet another china clay port and different types of cases were being sought to extend the theory. Truro was quite different from other ports sampled because it was inland, not dependent on china clay but it had just lost a core cargo from an extractive industry. In fact the data from the interview with the harbour master at Truro was so rich, both confirming and extending the emerging theoretical structure, that it was felt that the research could be brought to a close in its primary-data-gathering phase. However, secondary data gathering continued and this was strongly driven by the emerging theory. It continued until the 'story' had been completed and the analysis was closed.

8.3.3 Standard critical research evaluation: validity and reliability

Evaluation of qualitative research is different to, but equally as important as evaluation of quantitative research. It must be true when viewed from within its own epistemological perspective (Denzin and Lincoln 2000). Kitchin and Tate (2000) divide validity into three areas relating to theory, practice (argued above) and the integrity of the conclusions drawn from the research. Sarantakos (1998) adds empirical validation to the list. This validates a research instrument that either produces results supported by other available data or makes predictions that are found to be correct. This research has produced a result that contradicts most of the accepted understanding of small ports, although it is supported by Bird (1971) and Sargent (1938). Further research, or the passage of time during which small ports continue to thrive, may provide greater empirical validity in the future.

According to Sarantakos (1998), if research lacks empirical validity it must have theoretical validity to be acceptable. Measures of theoretical validity are face validity: does the instrument appear to measure that which it claims to measure; content validity: does it actually measure the intended content area; and conceptual validity: the theoretical foundations or the correct marriage of theory and methodology. The instruments in this research were semi-structured questions that differed from interview to interview. The opening questions were based on the literature review concerning ports and regional competitiveness, as explained in chapter three. They 'measured' all the apparent areas of inquiry except the question of the port's position within a cluster. This was a weakness. In fact the cluster concept was inadequately followed up during the rest of the research, mainly because the developing theory was driving in a different direction to the author's understanding of a 'marine cluster'. It was only after the primary data had been gathered and a further literature review had been conducted that the possibility of a different kind of cluster for a port appeared. The agricultural cluster revealed in Porter's (2003) work was then confirmed by the data, but it would have held greater validity if the original questions to stakeholders could have included a specific question about their perceived links with other businesses in the agricultural, transport, warehousing and logistics sectors.

Content validity is not in question for semi-structured interviews that are analysed through grounded theory. Even false answers have validity in such an analysis: the falsity becomes the data. Although there is no reason to suspect false answers in the present research there were biased responses, but again that became part of the data. Conceptual validity has been argued in chapter three where the choice of grounded theory was justified.

Validity relating to the practice of the grounded theory research has been argued above. The integrity of the conclusions drawn from the research rests on the integrity of the grounded theory method. Although there are some points of difference concerning an early literature review and a core concept, overall this research project has methodological validity. From that, it must have internal validity. Several authorities and practitioners recommend the use of two researchers who independently generate labels, codes, themes or categories in qualitative research to improve internal validity (Geiger and Turley 2003, Boyatzis 1998). This results in an expensive duplication of resources. So long as the labels and categories are grounded in the data they have internal validity. It is not necessary for the names to be the same so long as the theory that is created describes the phenomenon under investigation.

Reliability of the data was checked by sending transcripts back to the research subjects and asking for comments and corrections. This was particularly helpful in checking names and other minor details. One interviewee claimed that the transcript was not correct and refused permission for its use, which was of course respected.

8.3.4 Ecological validity: generalisability of the research

Of the twenty commercial ports and wharves in Southwest England listed in chapter three, Bristol, Falmouth, Fowey, Plymouth Millbay and Poole were excluded from the research because they were too large. Of the remaining fifteen, interviews were conducted concerning Teignmouth, Plymouth Victoria Wharf, Dean Quarry, Porthoustock and Truro. Two closed ports, Exmouth and Watchet were sampled and Dean Quarry and Charlestown have closed to commercial traffic subsequent to 2000. Charlestown is now a 'historic port' with a museum and large sailing ships that are used in film work. The remaining eight ports are all of course unique in their geography, history and demand conditions. Weymouth is a ferry port, like Plymouth Millbay. Portland is a former naval port that concentrates on bunkering but takes some containers. Penzance mainly exists to serve the Isles of Scilly. That leaves five small wharves and ports in Southwest England that are typical of the small bulk ports that were studied. Although qualitative research based on a few cases can never claim to be generalisable in the same way that quantitative research does, it is likely that that the 'story' told above would apply to them with little modification. No greater claim to generalisability can or should be made on the basis of this research alone.

8.3.5 Future research

The theories generated by this research should be tested against other small ports in peripheral maritime regions. A combination of case studies of some ports and a questionnaire survey of a large sample of small bulk ports would probably be the most effective means of testing them.

The critical importance of the fleet of small coastal ships demands more research into their precise numbers, age and replacement rate. The level of demand for small parcels of bulk cargoes should also be investigated, as well as ways to stimulate that demand (to remove freight from the roads), if the ships and wharves are there. Technological improvements to river-sea ships to make them better able to cope with winter sea-going conditions should also be continued.

Further investigation is needed into the type of port cluster suggested here and by Porter's (2003) research. In particular, it should be asked whether they apply only to small bulk ports or to larger ports. This could have a profound effect on maritime policy especially for the EU.

The institutional environment is an important factor in the sustainable small port. This research has explored the policy and legal environment within the UK, but further research should be conducted in other European countries with peripheral small bulk ports to examine the policy environment and its impact on the sustainable development of small ports. European Union policy should also be examined. At present, the emphasis is on the 'motorways of the sea' concept for moving containerised cargoes but short-sea policy and its effect, if any, on short-sea bulk cargoes should be looked at.

8.4 Conclusion

This chapter has presented the results of the research and their claim to validity. Areas of weakness have been acknowledged but in general, the findings are valid for the small ports and wharves of Southwest England.

Chapter 9 Conclusion

9.1 The aims of the research

This research was started with the intention of exploring the social and economic environment of small ports in the Southwest of England. Although several small ports were known to be thriving, the accepted port theory claims that small ports will disappear as large ports grow. To provide focus for the research, the initial questions centred on the contribution of these ports to the competitiveness of the region, an issue mentioned in the Government white paper "Modern Ports: A UK policy" (DETR 2000a). The aims were articulated as:

- To explore the social and economic environment of small ports and wharves in the Southwest of England
- To determine why, if present theory predicts that small ports will wither away as large ports grow, there are small ports and wharves in Southwest England that appear to be thriving
- To find out how the commercial ports and wharves within the Southwest of England (assuming they have a viable future) can best contribute to the competitiveness of the region

In order to meet these aims, the research project was broken down into five objectives, all of which have been realised:

> To categorise by size and type, and examine, the ports of Southwest England

In chapter two the historical development of ports in Southwest England was followed and tested against existing development theories. In chapter three, the ports of Southwest England were discussed and categorised by size and type. Recent changes to the ports were noted in chapters six and seven.

- To examine the concept and identify the determinants of port and regional competitiveness: to use these as a starting point for the collection of primary data

The concept and theoretical determinants of port and regional development were examined and determined in chapter three. It was explained in chapter four how these determinants were used to operationalise the initial phase of research. This understanding of port competitiveness was later updated in the light of recent literature and the findings of the research.

- To select and apply an appropriate approach to theory-building to create theories concerning the contribution of these ports to the socio-economic condition of the region

Grounded theory methodology was selected and used to research the field of small ports in Southwest England and to create several theories concerning the contribution of these ports to the socio-economic condition of the region

- To compare those theories with the existing theories in comparable areas

Existing theories of port development and competition were examined in depth in chapter two. These were drawn from models of colonial port development or containerisation, neither of which are directly relevant to small bulk ports in Southwest England.

- To draw conclusions about policy and commercial implications of supporting the contribution of such ports towards regional competitiveness

This is addressed in a later section of this chapter.

9.2 Evaluation of grounded theory methodology for port research

Grounded theory methodology is slow and extremely difficult to use without an experienced mentor. On the other hand, it almost guarantees an originality of results, especially in a new area. Some literature review, to frame the opening questions, is necessary in the business world. Manual analysis made the process very laborious but it did, of necessity, immerse the researcher in the data. It also helped to form categories and concepts by physically combining or separating the index cards that were used.

9.3 The results of the research

The data produced three broad and interlinked concepts concerning the ports that were researched. These concepts were:

- The Commercial Port
    - Port production
    - Internal and external factors
    - Port development plans
- Public and Politics
- Waterside regeneration

The Commercial Port concept was the largest and this was divided into three components, as shown above. Each concept was made up from a number of categories, which were precisely defined. Some categories could be applied to more than one concept and two categories, 'Environmental Concerns' and 'Local Politics', were common to all three concepts. Each category was made up from a collection of labels or codes, created through reading the original transcripts, not imposed from outside the data. Under each label were gathered the fragments of text to which those labels could be applied.

The properties of each category were investigated not only by reading the data fragments, but also by reading secondary sources of text relating to the categories, taken from books, journals, government documents, newspapers and websites. By reading, making memos, comparing cases and ideas, and writing up, a completely new theoretical structure concerning the small ports in the research sample was created. This structure was presented in narrative form in chapter eight. The principal findings are summarised below, under the headings of the three concepts and the issue of ports' contribution to regional competitiveness, which was the starting point for the research.

9.3.1 The Commercial Port

Port production and internal factors

The ecological theory of port competition is a completely novel contribution to knowledge. It says that a small port succeeds because it is adapted to a market niche with limited competition. The niche is related to port facilities such as storage, parcel size (dependant on type of commodity, demand, storage and land transport) and local geography. The niche may be so specialised for some commodities that the port is a monopoly provider, for example grain exports from Victoria Wharf in Plymouth, whilst for other commodities the port is in price competition with neighbouring small ports and large distant ports, for example animal feed imports at Teignmouth. The niche for very small commercial ports in Southwest England is non-time sensitive, low value, low profit margin dry and wet bulk cargoes and some bagged and palletised cargoes. Within the niche, the port can grow to the limits of its natural capability. These limits are set by the combined physical and demand conditions of the port. The importance of small ports, within their niche, is their role as trade facilitators, either as monopoly providers or as a lower cost alternative to other ports. Cost is calculated in terms of the total supply chain, not just the port dues, so a small, relatively expensive port can be cheaper overall because it has storage facilities and is close to the point of cargo generation. Cost is important because it determines the quantity of goods exported and imported and the consumers' and producers' surplus from that trade. The availability of different ports is important because it keeps overall supply chain costs down in a peripheral region, and so maintains diversity of economic activity within that region. The successful small port is aware of its customer base and uses niche or concentrated marketing to attract new business.

External factors

Small ports are, however, extremely vulnerable to relatively small changes in the external environment, especially as port town land has a high opportunity cost in terms of the housing, retail and leisure developments that could profitably be made on the land. Examples of such changes are the closure of an extractive industry (for example, the calcified seaweed dredging at Teignmouth) and tax changes affecting sales, storage or transport costs of substitute and complementary industries. A change in the external environment can result in the loss of a core cargo. This presents an opportunity to take on new cargoes. It also threatens the port, which may need a refuge from competition at times of particular difficulty. In other words, it needs a period when the commercial port is subsidised from retained earnings, other port activities, a parent company or public owner. If the institutional framework of the port is strong, it can find other cargoes and return to profitability or at least recover its costs. If there is no refuge from competition or that institutional framework of private interests and energy and public laws and policy is weak, the port will close.

Port development plans

The sustainable port is always developing. The immediate drivers for development are:

- Changes in ships
- Changes in storage requirements for cargoes, either through changes in trade or new standards
- Deterioration in the fabric of the port, especially from Accelerated Low Water Corrosion
- As part of a flood defence or other government sponsored scheme
- Higher environmental standards such as requiring enclosed cargo handling to prevent dust

The two problems with development are funding and consents. Infrastructure developments alone are not cost-effective at the rates of return on capital (15% or more) and over the time frame (ten years or less) demanded by public companies. New storage is commercially attractive, however, and may justify some spending on infrastructure. Otherwise funding must come out of the public purse. The justifications for such funding are:

- Local ports keep down costs for local trade. An efficient local port will increase economic growth in the area through the consumers' surplus for imports and the producers' surplus for exports. Without the port the higher transport costs will result in less or no trade.

- Local ports reduce lorry miles, with environmental benefits as sea transport is less environmentally damaging per tonne mile than road transport.
- As part of a necessary scheme for the public benefit, such as flood defence or defence of the realm
- Because infrastructure development can be justified on commercial grounds, but at a lower rate of return and over a twenty to fifty year time period which is not acceptable to private investors

Obtaining consents for any port development is a long and difficult process, enmeshed in environmental analysis and public enquiries. Governments tend to make promises about reducing the burden of regulation while, with the best of intentions, increasing it. In the short term, what small ports need is available and affordable expertise in negotiating the maze, especially for dredging consents. This can and should be provided by the Department for Transport.

9.3.2 Public and Politics

One new finding in the area of ports and port land is the existence of a sense of public ownership of land on the beaches and foreshore. There is no legal basis for this, but people believe that they have a right to access and use this land. Any proposal for port development must consider this belief because local people will fiercely resist attempts to build on 'their' beaches or mud flats. This 'public land' theory is not the same as environmental and habitat issues, although there is some overlap in the sense that people care for what they 'own'.

Apart from purely economic factors, the institutional environment is the most important factor for a successful port. This has three elements:

- The port management and ownership, their motives and dynamism
- The interface between the port and the local council, the expertise and attitude of the council
- The national and (to some extent) regional environment of policies, laws and regulations

The issue of local peoples' attitudes towards the port was explored, but this is only one element in the institutional environment and is mainly important in the way it affects the attitude of the council. There are positive and negative effects for a town that has a small commercial port in operation, but the idea that the 'port pays for the town', either through direct revenue or employment, is out-of-date and wrong. The negative effects of the port are environmental, such as dust and lorries. The positive effects for the town are a few direct jobs and second tier jobs, the visual impact and sense of vitality imparted by commercial shipping, and harbour income to cover the cost of conservancy for leisure boating and fishing. The true benefits of a port are spread over a much wider area, especially where the port is interdependent with an extractive industry, such as at Teignmouth with the Bovey Clay Basin.

9.3.3 Waterside Regeneration

If the port does close, an informed local council, if it is not the landowner, should be able to take some of the value of the land conversion process for the community it represents through planning gain. It should also be able to minimise or mitigate the negative effects of port closure through the use and enforcement of planning conditions.

9.3.4 Ports and Regional Competitiveness

In terms of regional competitiveness, a small port is a business in the traded sector, it is a facilitator of traded businesses, improving their competitive position, and it is essential to local extractive industries. In terms of clustering, a small port appears to belong more to a cluster of industries around agricultural products, fish products, supplies distribution, wholesaling transportation and logistics services, than to the obvious 'marine' clusters of ship fabrication or marine leisure. It is also a source of bridging social capital, valuable to knowledge spillovers, and to the quality of life of the region.

9.4 Applications of the research findings

The owners and operators of small bulk ports need to examine their strategic vision in the light of the findings from this research. Most operators already understand the niche markets they operate in, but this may not be fully understood or accepted by, for example, municipal owners. The strategy for small ports needs to be based on the understanding that they have a long-term future, rather than based on short-term profit maximisation.

Port investment and development is necessary for all ports to thrive and expand but at present, it is extremely slow and difficult to obtain consents. Immediate action needs to be taken to streamline the Harbour Revision Order system and raise the threshold for a public inquiry. The inordinate delays between an inquiry and the eventual decision also need to be reduced.

Water Freight Facility grants are available for port infrastructure developments but the uptake is very poor. Money for development is badly needed by small ports that propose and then abandon a number of projects because of a lack of finance. A mismatch here needs to be investigated.

As a result of the reports on Trust and Municipal ports (DETR 2000b, Department for Transport 2006d), the Department for Transport has gained a good understanding of the environment within which small ports operate. What is needed now are effective national and regional port policies that include the smallest as well as the largest ports. Policy makers are in a position to change the legal and regulatory environment of small ports for the better. They also have a role to play in discouraging short-term profit taking by port owners (especially private and municipal owners) who may be tempted to sell port land rather than develop the port as a commercial enterprise.

Better port statistical information should be available within the UK. At the moment, 'minor ports' are lumped into a single mass within a region, although modern data handling techniques allow for far more disaggregation of statistics. It is difficult, without detailed research, even to know what ports are still operating. For example, MDS Transmodal treated Watchet as an open port in their demand forecasts for the Department of Transport in 2006, although the port had been converted into a marina by 2001 (MDS Transmodal 2006).

The failure to replace an ageing fleet of ships below 3,000dwt is a long-term threat to small ports. Economies of scale make them less profitable than ships of 3,000dwt to 5,000dwt or larger unless a freight premium is available. The main source of fleet replacement is the building of new river-sea ships, but these are vulnerable to winter weather conditions in the waters around the British Isles and North West Europe. Urgent action is needed by policy makers to encourage the replacement of small ships with vessels able to trade all year round. Without such action, those ports that cannot take ships over 3,000dwt will have to invest in new infrastructure or they must eventually close, despite the overall environmental benefits of short sea shipping. The EU, in contrast to the UK, has a strong policy of supporting short sea shipping. However, this is focussed on the 'motorways of the sea' concept, with little application to wet and dry bulk shipping. Where State aid is permitted by the EU, it is for the ports, rather than the ships, although it can be argued that ships are the infrastructure of the seaways and therefore eligible for subsidy (SUSTRANS 2006). At present, unsubsidised shipping is competing against subsidised roads and railways. This policy needs to be reviewed at EU level.

Small bulk ports and wharves are here for the long term. They have an enormous amount to contribute to their local economy. Small ports do have a long-term future in economic terms but much depends on the institutional environment in an imperfect transport market. They can be part of the environmental agenda to reduce carbon emissions by shifting freight from roads to water. They are also vulnerable and some more will probably close. When that happens the local council must take an active and informed role to maximise employment prospects and regenerate the area, and minimise the losses that will result from port closure. The role of the local council is to mediate between the developer and the local people.

This inquiry has laid some theoretical foundations and opened the way for further research to be undertaken into the significance of unimportant ports.

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Appendix A: request to amend a transcript

INVESTOR IN PEOPLE

Sarah

Please amended script where the pages are stained over — also on the last page i.e. put 2 updates.

Regards Andy.

with **compliments**

Kernow Kenyel

Carrick
DISTRICT COUNCIL

harbour office

Town Quay
Truro
Cornwall
TR1 2HJ

tel: 01872 224231 or 01872 272130
fax: 01872 225346

www.portoftruro.co.uk
harbouroffice@carrick.gov.uk

Andrew Brigden
[illegible]
Head of Maritime Services and Harbour Master