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Hinterland Connections of Seaports

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List of Abbreviations

APA	Almaty Programme of Action
CIS	Commonwealth of Independent States
DG TREN	Directorate-General for Energy and Transport
ECA	Emissions Control Area
EATL	Euro-Asian Transport Linkages
EECCA	Eastern Europe, Caucasus and Central Asia
EPA	Environmental Protection Authority
ESPO	European Sea Ports Organisation
EU	European Union
GT	Gross tons
HGV	Heavy goods vehicle
IMO	International Maritime Organisation
IWW	Inland Waterway
LPI	Logistics Performance Index
MDG	Millennium Development Goal
NSI	National Statistical Office
OSCE	Organisation for Security and Cooperation in Europe
SEE	South East Europe
SPECA	Special Programme for Economies of Central Asia
TEM	Trans-European North-South Motorway
TEN-T	Trans-European Transport Network
TER	Trans-European Railway
TEU	Twenty-foot equivalent unit
TINA	Transport Infrastructure Needs Assessment
UNCTAD	United Nations Conference on Trade and Development
UNECE	United Nations Economic Commission for Europe
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
WTO	World Trade Organization

Executive summary

To be completed once report is finalised

1. Introduction

1.1 Scope of report

The fundamental purpose of this report is to examine ways in which ports and their hinterland connections can be influenced to improve supply chain performance, both in terms of specific port-hinterland links and between ports and inland areas across the UNECE region as a whole. The report will include the entire UNECE region, although most of the focus will be on Europe and Central Asia; North American experience will be included where appropriate, particular insofar as determining whether there are examples of good practice that may be transferable to other UNECE countries.

The assumed definition of a port's 'hinterland' is the area inland from the port to which imports are distributed and from which exports are collected[1]. For a number of reasons, not least the limited extent and quality of inland transport networks and restrictions on cross border movements, ports traditionally each tended to have a relatively clearly defined independent hinterland. This situation changed considerably in the second half of the 20th century as a consequence of infrastructural, political and technological developments, with Cuadrado et al. (2004, p.322) highlighting that "it is no longer possible to talk about captive traffic in a port but rather volatile traffic which can be captured by several ports". This report adopts this concept that port hinterlands are generally indistinct and overlapping, with considerable variability in both the short- and long-term. The availability and cost of inland transport services have typically been the determining factors, but others such as journey time and service quality factors (e.g. variability of transit time, in-transit risk and damage, provision of value-added services) have increasingly influenced the nature and extent of ports' hinterlands. Further discussion can be found later in the report. The specific functions and tasks set out in the terms of reference for preparing this report are as follows:

- To describe and analyse the available information on container and ferry freight transport trends and projections in the UNECE region
- To describe and analyse the policy response to traffic congestion and other problems in hinterland connections of seaports while sharing and drawing on good practices, conclusions of the UNECE Conference (Piraeus, 17-18 September 2008) and other relevant contributions and available research, including the problems facing UNECE landlocked emerging market economies in respect to the efficiency of seaport operations and their connectivity with inland transport modes

1.2 Study aims and objectives

The study aims to analyse the performance of and bottlenecks in hinterland transport connections of seaports. In order to achieve this, the following specific objectives have been set:

- To determine the key issues in the existing literature relating to the performance of seaports and their hinterland connections
- To assess the key trends in the container and ferry markets in the UNECE region, including port hinterland flows

[1] This definition may be complicated by the consideration of feeder (i.e. coastal) shipping services from a hub port; this will be discussed later in the report.

- To identify good practice in achieving efficient and sustainable hinterland goods movements
- To consider ways in which the specific problems faced by landlocked emerging economies can be overcome
- To recommend ways in which the connectivity of seaports and their hinterlands can be improved

1.3 Methodology

The study is based on the adoption of a mix of quantitative and qualitative techniques, with the analytical process being evidence-led as much as possible. The study draws on a range of sources of material, including published statistics, academic literature and industry reports. In addition, considerable use has been made of the material presented at the UNECE Conference on Hinterland Connections to Seaports which took place in Piraeus, Greece in September 2008 and an original questionnaire survey of port authorities conducted by UNECE.

1.4 Structure of report

The report first (in Sections 2 and 3) sets the scene by synthesising the salient points from the published literature and then summarising the policy background that influences international trade flows. In Section 4, the original information gathering elements of this project are reported, namely a summary of the key findings from the UNECE Piraeus conference and the implementation of the questionnaire survey of port authorities. Section 5 presents the key trends and projections for container and ferry traffic in the UNECE. Section 6 explores in detail the key issues and challenges facing hinterland connections to seaports, with a particular focus on the landlocked emerging economies in central Asia. In Section 7, examples of 'good practice' for port hinterland flows are identified. Section 8 presents a structured assessment and discusses what the next steps should be, incorporating a series of policy recommendations for UNECE which are aimed at improving the efficiency and sustainability of hinterland connections to seaports. Finally, Section 9 presents a concise set of conclusions.

Table 1.1: Relationship between study objectives and report structure

	Section of report							
Study objectives	2	3	4	5	6	7	8	9
To determine key issues in existing literature relating to performance of seaports and their hinterland connections	●	●		○	○			
To assess key trends in the container and ferry markets in the UNECE region, including port hinterland flows			○	●	○			
To identify good practice in achieving efficient and sustainable hinterland goods movements			○		○	●		
To consider ways in which the specific problems faced by landlocked emerging economies can be overcome					●	○	○	
To recommend ways in which the connectivity of seaports and their hinterlands can be improved							●	●

Key: ● – strong relationship; ○ – lesser relationship

2. The policy context

2.1 Introduction

This section sets out the existing situation with regard to the policy framework influencing ports and their transport links; the role for policy to influence hinterland movements in the future will be explored later in the report. Given the importance of the EU within the UNECE region, and the lead that it has taken in formulating transport policy, much of this section is devoted to the evolution of EU policies that are of relevance to port hinterland connections. The broad transport policy framework is described first, followed by specific initiatives that have particular relevance for port hinterland connections. A brief review of relevant UNECE policies is then presented, followed by an overview of the growing importance of wider sustainability policies that are increasingly likely to influence supply chain operations in the future.

2.2 European Union transport policy

The policy context has evolved considerably since the early-1990s, when the EU first turned its attention to the development of a Europe-wide transport strategy, with an increasing role for port-related policies in the last decade. EU Transport White Papers have been produced in 1992 and 2001 (European Commission, 2001), followed more recently by a review of the 2001 White Paper (European Commission, 2006a) which sought to evaluate and give new direction to EU transport policy to reflect the changing situation, notably resulting from the EU enlargement from 15 to 27 countries since 2004. The enlargement has led to more variability in the concerns relating to freight transport flows, from the increasing focus on the environment and congestion in the more western member countries to the more traditional concerns about infrastructure provision and accessibility in many of the new member states. As a consequence of this and other changes (e.g. continued globalisation of logistics activity, increasing evidence of climate change, adoption of new technologies), the EU argues that a "broader, more flexible transport policy toolbox is needed" (European Commission, 2006a, p.6). The policy focus is very much on sustainable mobility, though there is still tension between the efforts to promote economic growth and improve accessibility and the stated need to reduce the consumption of fossil fuels and the associated greenhouse gas emissions. The review calls for public policy to align itself with the concept of 'comodality', defined as the optimal and sustainable use and combination of the various modes of transport, in combination with measures to fully internalise the costs of the different modes.

2.3 Specific EU initiatives

Recognising the widely differing approaches in EU member states, the Green Paper on Sea Ports and Maritime Infrastructure (European Commission, 1997) focused the policy-makers' attention on goods flows through ports, primarily concerning itself with the role of ports within the Trans-European Transport Network (TEN-T) programme, the finance and charging regimes for ports and the organisation of port services. By this time, it was recognised that ports were important transfer points in the intermodal transport chain, and consequently that the growth in maritime goods transport and the concentration of activity at a relatively limited number of ports in combination were factors influencing land-based transport activity. More recently, the EU has produced two communication documents that are relevant to this study: a Communication on an Integrated Maritime Policy for the EU (European Commission, 2007a) and a Communication on a Ports

Policy (European Commission, 2007b). The former has a very broad remit, recognising the supranational nature of many issues relating to the maritime environment, and identifying interrelationships between trade, fishing, national security, environmental impacts, etc. The latter communication focuses its attention specifically on the ports sector, identifying the following key challenges:

- Increasing demand for international transport
- Technological changes, not least the development of container transport and a range of IT applications
- Commitment to tackle greenhouse gas emissions, local air pollution and road congestion
- Involvement of stakeholders in the port region and beyond

In addition, given the nature of many port undertakings, often in receipt of public funds and frequently also being public or quasi-public bodies, compliance with Directive 2006/111/EC is necessary. This sets out obligations to ensure the transparency of financial relations between member states and public undertakings. This also applies to other elements of the transport system where the public sector may operate or fund aspects of infrastructure or service provision.

Overall, the evolution of maritime and inland transport policies has traditionally not been well-integrated, although there are signs that this is now improving. An example can be seen with the evolution of the TEN-T programme. This was adopted by the EU in 1996, with the aim of removing obstacles to the implementation of the Single European Market through the creation of modern and efficient strategic transport infrastructure across the continent. Progress has generally been slow, leading the EU to review the initiative and focusing much more clearly on transnational projects. A revised set of 30 transnational corridors was identified in 2004 (European Commission, 2005), a number of which relate very directly to port connections while others are likely to have a more limited impact. Those projects most closely related to ports and their hinterlands include the new Betuwe line connecting Rotterdam and the German border, the UK/Ireland/Benelux road axis providing landbridges between ferry ports, the rail axis from Algeciras to France, and the Rhine/Meuse – Main – Danube inland waterway axis. Specifically considering ports, almost 300 are included in the TEN-T programme, but there has been little prioritisation so far. To promote short-sea shipping, the Motorways of the Sea initiative was adopted as part of the TEN-T programme in 2004, with four main aims (European Commission, 2006b):

- to encourage more efficient, cost-effective freight transport that is less polluting
- to alleviate road congestion on Europe's strategic road network
- to improve the connectivity of peripheral regions, enhancing cohesion across Europe
- to help to promote economic growth in a more sustainable manner

In addition to the TEN-T budget, projects may be eligible for funding from Cohesion and Structural Funds. The EU intends to have a network of Motorways of the Sea projects in operation by 2010, though progress to date has been limited. Consultation is taking place in early-2009 as to how the TEN-T programme can better meet the EU's economic and environmental objectives, with the Green Paper (European Commission, 2009) identifying the interconnection of modes for flows such as those to/from port hinterlands

as being important considerations. Concurrently, the EU is also working on extending a number of the axes to neighbouring countries, most of whom are members of UNECE.

The Freight Transport Logistics Action Plan identified that "the surge in containerised trade and liner shipping is leading to high congestion in certain seaports and port-hinterland connections" (European Commission, 2007c, p.2), and that the performance of terminals (including ports) is critical for supply chain efficiency. This Plan also argues the need for the removal of administrative barriers within the maritime sector in the EU to increase the attractiveness of short-sea shipping, and promotes the concept of 'green corridors' for freight in conjunction with the TEN-T programme and other initiatives such as the priority rail freight network. In December 2008, the EU published further, more detailed, proposals for developing international rail freight corridors and encouraging interoperable systems (European Commission, 2008), recognising the typical problems encountered when using rail for cross-border flows and proposing a series of measures designed to encourage greater use of rail for such flows.

2.4 Relevant UNECE policies

There are many previous studies and existing initiatives that impact on port hinterland flows, and this report takes cognisance of those that are of particular significance. In particular, the following UNECE projects are of direct relevance:

- Trans-European North-South Motorway (TEM) Network, aimed at improving the quality and efficiency of transport operations across much of Central and Eastern Europe
- Trans-European Railway (TER), intended to develop efficient international rail and combined transport operations through Central and Eastern Europe
- Special Programme for the Economies of Central Asia (SPECA), a joint UNECE-UNESCAP activity which includes a Working Group on Transport and Border Crossing Facilitation
- The Euro-Asian Transport Linkages (EATL) project, another joint UNECE-UNESCAP programme which incorporates numerous initiatives (including TEM and TER) with a broader geographical remit for the development of transport links between Europe and Asia

In many respects, these UNECE projects complement EU transport and trade policies by extending the focus further east towards non-member states in Eastern and South Eastern Europe and Central Asia. It is also important to bear in mind the Millennium Development Goals (MDGs) which underpin the United Nations' work in improving economic, social and environmental conditions around the world. The goals were developed as a consequence of Agenda 21, a sustainable development programme agreed by the UN in 1992, and the goals are as follows:

- MDG1: Eradicate extreme poverty and hunger
- MDG2: Achieve universal primary education
- MDG3: Promote gender equality and empower women
- MDG4: Reduce child mortality
- MDG5: Improve maternal health
- MDG6: Combat HIV/AIDS, malaria and other diseases
- MDG7: Ensure environmental sustainability

- MDG8: Develop a global partnership for development

Many of these goals are of greater relevance to the least developed countries, for example in Africa, but the latter two are of particular significance to the entire UNECE region; some of the others do apply to the relatively less developed UNECE countries in Eastern Europe, Caucasus and Central Asia (EECCA) and South East Europe (SEE). In addition, UNECE (2006) views the development of transport infrastructure as a factor in addressing poverty reduction (MDG1). The transport infrastructure projects outlined above are viewed as being important components of the plan to meet the goals through infrastructure agreements dealing with road, rail, inland waterway and combined transport networks.

2.5 Policies in support of sustainability

With the notable exception of the United States, the overwhelming majority of UNECE countries signed and ratified the Kyoto Protocol, which set differential targets for greenhouse gas emissions by 2008-2012 based on 1990 levels. For the EU-15, the target reduction was 8%, but the majority of countries look unlikely to meet this given recent trends. However, the climate change problem is now regarded as more serious and urgent than when the Kyoto Protocol was agreed, and stricter targets are being developed. By the end of 2008, for example, the EU is expected to agree a carbon emissions target of at least a 20% reduction by 2020 (based on 1990 emissions levels); this may be increased to 30% as part of a more global agreement. A successor to the Kyoto Protocol is under negotiation at present, and in 2007 the G8 nations agreed an aim to reduce carbon emissions by at least 50% by 2050. Some countries are developing even more stringent targets, such as the United Kingdom which has now agreed a greenhouse gas emissions target reduction of 80% by 2050.

Transport is a significant contributor to greenhouse gas emissions, and its share of total emissions has been rising. Across the European Union, carbon emissions from freight transport are rising rapidly, with the overall growth in activity (particularly by road) far exceeding efficiency improvements. For the EU-27, total greenhouse gas emissions fell by 8% between 1990 and 2004, but rose by 26% in the transport sector (excluding international aviation and maritime transport); in 2005, the transport sector accounted for 22% of EU-27 greenhouse gas emissions (EEA, 2008). If maritime transport activity was also included, the scale of the problem would be even greater. It is evident, therefore, that transport is a vital sector on which to focus attention so as to meet emissions reduction targets, and that international flows by sea and feeder modes are a major contributor to the problem.

2.6 Summary of the current policy context

European transport policy has traditionally concerned itself with transport liberalisation and the development of a competitive market as a means of achieving economic growth and the implementation of the Single European Market. Within the last decade, however, sustainability concerns have become increasingly important, with mode share issues and the internalisation of external costs featuring strongly. At present, therefore, policies aim to balance economic development/globalisation and sustainability, with the likelihood of increasingly stringent targets for greenhouse gas emissions, and company-specific caps (for large companies) which may influence decision-making and encourage greater sustainability within supply chains.

3. Literature review

This section seeks to identify the key themes from the previous literature relating to port hinterland connections; there is not scope here to go into detail about all of the issues raised before, but many specific points will be explored in further detail in the context of the report's later analysis. First, the general literature relating to developments in maritime logistics chains is reviewed briefly. This is followed by a summary of the main literature examining the importance of port hinterland connections. Specific trends in the container (and ferry) sector are analysed in Section 5 rather than in this section.

3.1 Developments in maritime logistics chains

International trade can be an enabler of economic growth and enhanced productivity, although the direct role of transport infrastructure and service provision is difficult to quantify (HM Treasury, 2006a) since it is difficult to isolate the specific transport effects. The development of global logistics chains has had a major impact on the function of ports (OECD/ITF, 2008) and, as a consequence, of port hinterland connections. The performance of the transport system directly impacts on transport costs and, as a consequence, on logistics costs, with some evidence that transport costs are a barrier to international trade volumes (ECMT, 2005; HM Treasury, 2006a). According to ECMT (2005), half of all international trade by weight is between countries no more than 3,000 km apart, with longer distance trade often constrained by high transport costs.

In the container shipping market, Cariou (2008) argues that there have been three key trends since the early-1990s: horizontal integration; vertical integration; and the development of larger vessels. In each case, the scale of operation has increased and shipping lines have consequently become more significant global players in the logistics chain, gaining additional decision making powers. At the same time, ports have typically become less dominant as competition between ports has been increasing and new or enlarged ports have developed, providing more choice to shipping lines (Pando *et al.*, 2005). In consequence, ports have become more commercially aware, recognising the need for efficient operations within the port area itself, but also along the logistics chain. With the globalisation of flows, shippers and customers have become more concerned about the performance of the entire logistics chain (OECD/ITF, 2008). Van de Voorde and Vanelslander (2009, p.5) state that "the competitive strength of a port or any other maritime player does not depend exclusively on the own infrastructure and organisation; it is also affected by a variety of other market forces". The authors emphasise that market actors are now increasingly chosen for their role in a successful international maritime logistics system rather than on the basis of their individual performance.

A key question that has not yet been resolved in the literature is the extent to which economies of scale and scope can continue to be gained from ever-increasing container vessel size and port throughput. Van de Voorde and Vanelslander (2009) believe that the costs associated with handling ever larger volumes from ever larger ships at hub ports may open up opportunities for more cost effective direct services between smaller ports where volumes justify this. Hub-based networks tend to be favoured when flow density is low, since volume can be consolidated over the long distance leg, but are less attractive when flow density rises above a critical mass that favours direct service provision (OECD/ITF, 2008). One way in which increased economies have been generated has been the evolution of transhipment, where containers are transferred from deep sea to feeder vessel (and vice versa) to separate out the trunk flow from the

onward distribution/collection. According to Baird (2007), for at least 20 of the 100 largest container ports the majority of traffic handled is ship-to-quay-to-ship, rather than being transferred to/from other modes of transport.

3.2 Port hinterland connections

The issues relating to hinterland connections in the context of port competition are comprehensively covered by the OECD/ITF Joint Transport Research Centre Round Table (OECD/ITF, 2008) and the supporting documentation (e.g. de Langen, 2008; Notteboom, 2008; Zhang, 2008). It has been asserted that "in most door-to-door transport chains, the costs of hinterland transport are higher than maritime transport costs and port costs combined" (de Langen, 2008, p.10), and the increasing attention being devoted to hinterland transport problems suggests this to be the case. Notteboom (2008) agrees that shipping lines are cognisant of the increasing importance of the quality of the land connections for their customers, given the potential that they have to affect the overall door-to-door performance of the logistics chain. Given that ports' hinterland areas have typically been growing, from both the perspective of specific ports and of product supply chains the importance of considering port hinterland connections has increased. This is confirmed by Wiegmans *et al.* (2008), who identify that the availability and performance of inland connections as being one of the key criteria applied by deep-sea container shipping lines when deciding on port calls. In the context of imports to the USA from Asia, Leachman (2008) highlights inland transport costs as being an important factor in port choice, with this being a function of the quality of the connections available, emphasising that the issue is not limited to Europe. Port hinterland connections typically involve a wide range of actors, which adds to the complexity of dealing with the problems identified.

The wider arguments for giving greater consideration to port hinterland connections for reasons of economic development and sustainability are well rehearsed. For example, the Eddington Transport Study (HM Treasury, 2006a) asserted that poorly performing ports or internal transport networks could significantly reduce the volume of international trade and claimed that, even with full internalisation of environmental and social costs, further capacity will be required at ports and on the hinterland routes. It seems clear that increasing strain will be placed on port hinterland connections if the current hub-based shipping model continues to develop, since larger volumes of goods will need to be moved to/from the hinterland areas of the major ports. This may benefit the rail and inland waterway modes, which are better able than road to move large volumes in an efficient manner. If there is a move towards more direct service provision, a different set of hinterland connections would be expected to develop. Pricing of the environmental and social costs is an important issue, and if fully implemented would be expected to alter the status quo of port hinterland flows in favour of alternative modes and, perhaps, fundamentally different logistic chain structures. To date, there has been little coordinated international (or even national) intervention to systematically deal with the internalisation of such costs (OECD/ITF, 2008). This has important implications for the role of the different transport modes.

De Langen (2008) believes that port authorities often have a role to play in the integration of hinterland connections into the logistics chain, particularly where they have a public policy role to reduce the externalities of logistics-related activities. While this typically will involve improvements within the port area itself, or in the connections between the port and the hinterland networks, there may be arguments for involvement

in hinterland connections more distant from the port. An important objective will typically be to boost port throughput in the face of competition from other ports. Gouvernal *et al.* (2005) argue that, along with efficient port operations, well-functioning hinterland connections are an important factor in maintaining the dominance of the established northern range ports in Europe. This makes it more difficult for ports in the Mediterranean to gain a larger share of the market, even from Asia where they would be expected to have an advantage in distance and time terms. As a consequence, the Mediterranean ports still largely serve hinterlands that are far more restricted than those of the large ports such as Rotterdam, Antwerp and Hamburg.

Parola and Veenstra (2008) argue that shipping lines have been more successful at developing global strategies than have ports or container terminal operators, consolidating their strong position in the marketplace. As identified earlier (Cariou, 2008), a well established trend towards vertical consolidation in the maritime shipping and port industry has evolved at the same time. For some time, container shipping lines have acquired or developed cooperative arrangements with port terminal operators, and this is increasingly spreading to involvement in the inland rail and water transport operations serving port hinterlands. This is particularly noticeable at the main hub ports, where shipping lines have expanded into the inland transport market, for example in operating their own rail services and inland terminals. This has led to greater integration of the maritime and land legs of logistics chains, typically with increased consolidation of inland volumes and a consequent higher modal share for rail (Notteboom, 2008). The 'dry port' concept has evolved (see, for example, Roso *et al.*), linking seaports directly by rail to inland container terminals, which is a means of container terminals and/or shipping lines extending their reach along the logistics chain, with the aim of improving the door-to-door experience and achieve modal shift away from road to rail. Similarly, Konings (2007) identifies similar opportunities using inland waterway transport inland from Rotterdam through the development of 'trunk line' operations in the port's hinterland to key inland terminals.

The impact of these trends on future hinterland flows is not clear, as the growing dominance of large shipping lines would seem to make liner services more likely to switch between ports in response to changes in competitiveness, while the development of long-term relationships between shipping lines and terminal operators or transport providers appear more likely to reduce the likelihood of port switching. Similar issues have been raised about consolidation within the hinterland modes, notably the rail freight industry. As Pilsbury and Meaney (2009) discuss, there is a growing trend for both horizontal and vertical mergers involving rail freight companies, but it is not yet clear whether this is beneficial for, or a hindrance to, competitive and sustainable logistics chains.

The World Bank (2005) has emphasised the importance of considering corridors, particularly at the international level, as a means of improving the physical flows of goods when compared to the traditional consideration of transport infrastructure and services on a fragmented basis. A useful distinction is made between three types of trade corridors: domestic trade corridors; foreign trade corridors; and transit trade corridors. The second and third types are important in the context of port hinterland flows. Foreign trade corridors perform a role in moving imports and exports for a particular country, using either ports or international land border crossings. Transit trade corridors are used to move goods between other countries, normally with a port or land border crossing at one end and a land border crossing at the other. Well performing

corridors of both types are important in enabling international trade and improving efficiency and competitiveness as a result of economic cooperation and regional integration.

3.3 Summary

In addition to the public policy concerns identified in Section 2, it seems that port authorities need to take seriously the performance of their hinterland connections. Hinterland areas are rarely captive now, but are instead contestable with two or more ports competing to serve the inland areas. This has led to the removal of distinct hinterlands and the emergence of overlapping port coverage of inland areas. Given that logistics chain decision makers are now more likely to be considering the attributes of entire chains rather than specific legs, and as a result of hinterland connections increasingly becoming the weakest link of the chain, there is a considerable risk that ports will suffer a loss of traffic if their connections are inefficient or costly. There does not appear to be a consensus in the literature as to the appropriate balance between public policy intervention and free market competition in the port hinterland market.

4. The UNECE Piraeus conference and questionnaire survey

This short section first presents the key findings of the UNECE Piraeus conference and second provides background information relating to the original questionnaire survey that has been conducted for this project.

4.1 Key findings of the UNECE Piraeus conference

This section is intended to provide a brief summary of the findings of the two day conference held in Piraeus, Greece, in September 2008. Full details of the conference presentations can be found on the UNECE website (UNECE, 2008), and specific points are discussed in later sections of this report as appropriate. The conference featured a large number of presentations organised into four main themes:

- Seaport good practices: the interface between maritime and inland transport
- Hinterland connections of seaports: bottlenecks or seamless links with roads, railroads and inland waterways
- Port operations and management: a key factor in the supply chain management
- Challenges to the development of seaports in the globalised world

There was considerable discussion regarding the importance of ports within supply chains that are becoming increasingly global in nature, reflected in the dramatic increases in volumes of containers and other unitised loads passing through the key UNECE ports in recent years. Much of this growth has resulted from the rapid development of Chinese manufacturing industries, with unprecedented growth in throughput at the key Chinese ports since the early-2000s. Hinterland connections were identified as a generally weak link in international supply chains since they were typically fragmented with their provision and use being the responsibility of many different actors from both the private and public sectors. This applies to port activities themselves, transport links along hinterland corridors, and the inland terminals used to handle international flows. While much of the focus of the conference related to physical infrastructure provision and capability, it is important to recognise the potential impacts of other factors such as improved asset utilisation, better regulation, adoption of new technologies, reduced bureaucracy and greater interoperability (particularly at international borders), more international cooperation between supply chain parties, etc. Perhaps understandably, there often remains a tendency for governments to take a fairly nationalistic approach to port hinterlands, although there is evidence of EU cross-border policies taking effect within its area. The importance of well functioning hinterland connections was noted as being a particular issue for land-locked economies which have no direct access to their own port facilities, especially those in central Asia where poor quality international connections seriously hinder economic development.

In addition to issues surrounding the efficiency of hinterland operations, the importance of reducing the environmental impacts of international freight flows was also stressed, as was the role of international trade in encouraging broader social and economic development in line with the Millennium Development Goals. Environmental and social issues featured more strongly in the presentations from the more ‘western’ parts of the UNECE region, while further east the focus on economic development often dominated. A number of speakers commented on the tendency for public or private agencies to focus on specific issues, for example related to a particular mode, port or corridor, rather

than taking a more holistic, system-based approach that considers supply chains as a whole.

For the future, a key question relates to the scale of port development and the impacts on hinterland flows, both in terms of efficiency and sustainability. There was no clear consensus as to whether the continued development of hub ports is to be encouraged, often with long distance hinterland movements as a consequence, or whether it would be more beneficial to encourage the 'regionalisation' of port activity to reduce land-based legs. Alternatively, a hierarchical sea-based network may be a viable option, with greater use of feeder shipping services between hub and regional ports. These issues will be explored later in this report. It is evident, though, that there are many different port capacity schemes at various stages of development and implementation, but only a limited awareness of the extent to which hinterland flows may be affected in the future.

4.2 UNECE questionnaire survey

A questionnaire was developed by UNECE for distribution to port authorities, freight forwarders, infrastructure managers, terminal operators and transport ministries of UNECE member states. A copy of the questionnaire is shown in Appendix 1. A total of 33 completed questionnaires were received, each relating to the situation at a single port or terminal. As can be seen from Table 4.1, 15 countries are represented in the responses, though many of these have only one port included in the survey. Turkish ports comprise almost 40% of the respondents, with a lack of any representation from ports in many key countries such as Italy, USA and Scandinavian countries. Despite concerns about the extent to which the sample is representative of ports in the UNECE, nine of the top 20 EU container ports and three of the top 10 EU ro-ro ferry ports are included; in addition, two of the top 20 non-EU container ports in the UNECE region responded. Analysis of the questionnaire responses is incorporated into later sections of the report as appropriate.

Table 4.1: Responses to UNECE questionnaire survey

Country	**No. of responses**	**Ports included**
Belgium	1	Zeebrugge
Bulgaria	1	Bourgas
Canada	1	Halifax
France	1	Marseille
Germany	1	Bremen-Bremerhaven
Latvia	1	Riga (Baltic Container Terminal)
Lithuania	1	Klaipeda
Netherlands	1	Rotterdam
Poland	3	Gdansk, Gdynia, Szczecin-Swinoujscie
Russian Federation	1	Novorossiysk
Spain	4	Algeciras, Bilbao, Las Palmas, Valencia
Switzerland	1	Basel
Turkey	13	Akdeniz, Bandirma, Borusan, Derince, Gemport, Haydarpasa, Iskenderun, Izmir, Mardas, Marport, Mersin, Samsun, Trabzon
Ukraine	1	Odessa
United Kingdom	2	Dover, Felixstowe
Total	**33**	**-**

5. Container and ferry freight transport activity in the UNECE region

This section first briefly charts the global trends in international trade and, more specifically, the container sector, since these influence maritime and hinterland freight transport activity in the UNECE region. It then examines the specific recent trends at UNECE container and ferry ports, before considering the projections for future traffic levels to 2020 (and beyond). It should be noted that the data used to analyse the trends come from a range of sources that are not always wholly consistent with each other as a result of differing methodologies and assumptions. Where there is significant variability, this is highlighted in the text.

5.1 International trade trends

Global economic development is a key driver of international trade growth, and has increased rapidly since the mid-20th century. Table 5.1 reveals the economic growth rates at the global level and for specific country groups and countries in the UNECE region for the period since 1991. On average, global economic growth has increased by more than 3% per annum between 1991 and 2008. Broadly speaking, since 2002, economic growth rates in the EU and United States have been lower than the world average while those in South East Europe and CIS have been far greater.

Table 5.1: World economic growth, 1991-2008

Region/country	1991-2001[a]	2002	2003	2004	2005	2006	2007[b]	2008[c]
World	**3.1**	**1.9**	**2.7**	**4.0**	**3.4**	**3.9**	**3.8**	**2.9**
Developed countries	**2.6**	**1.3**	**1.9**	**3.0**	**2.4**	**2.8**	**2.5**	**1.6**
of which:								
United States	3.5	1.6	2.5	3.6	3.1	2.9	2.2	1.4
European Union	2.4	1.2	1.3	2.5	1.8	3.0	2.9	1.8
of which:								
Euro area	2.2	0.9	0.8	2.0	1.5	2.7	2.6	1.6
France	2.0	1.0	1.1	2.5	1.9	2.2	2.1	1.5
Germany	1.8	0.0	-0.2	1.2	0.9	2.9	2.5	1.8
Italy	1.6	0.3	0.0	1.1	0.0	1.7	1.5	0.4
United Kingdom	2.8	2.1	2.7	3.3	1.9	2.8	3.0	1.6
South East Europe & CIS	**-**	**4.9**	**7.1**	**7.6**	**6.6**	**7.5**	**8.4**	**7.4**
South East Europe [d]	-	3.0	2.4	4.5	5.0	5.0	6.0	5.2
CIS	-	5.2	7.6	8.0	6.8	7.7	8.6	7.6
of which:								
Russian Federation	-	4.7	7.3	7.1	6.4	6.7	8.1	7.5
Turkey	**-**	**7.9**	**5.8**	**8.9**	**7.4**	**6.0**	**4.5**	**-**

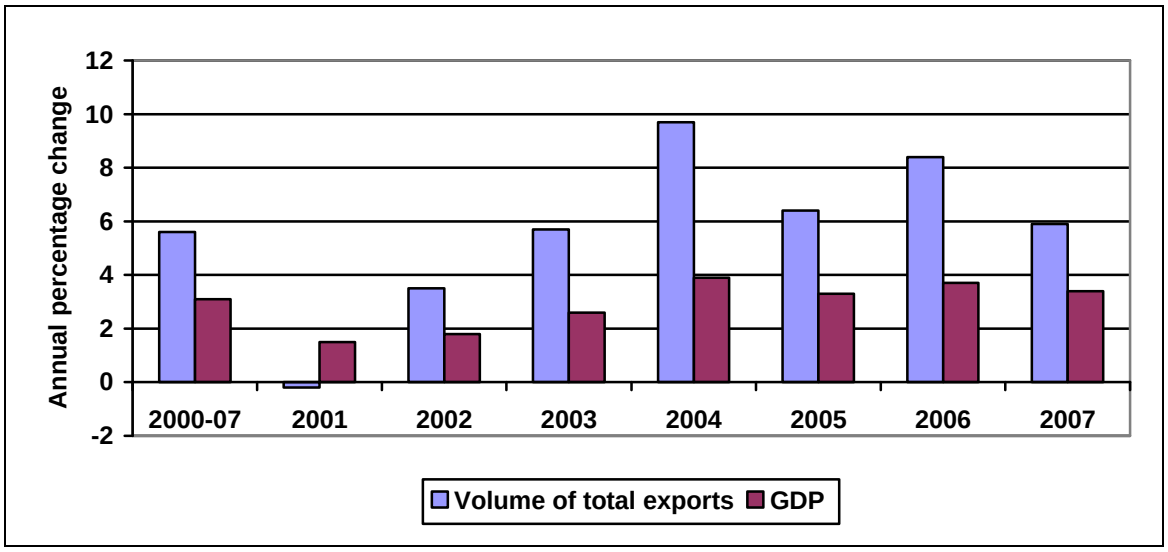
[a] – average; [b] – preliminary estimate; [c] – forecast; [d] – Albania, Bosnia & Herzegovina, Croatia, Montenegro, Serbia and FYR Macedonia

Source: based on UNCTAD (2008a)

Globally, trade volumes have increased at a much greater rate than economic growth, as is evident from Figure 5.1. With the exception of 2001, when trade volumes actually decreased due to the prevailing economic conditions, the total volume of exports has substantially outstripped economic growth. The admittance of China to the WTO in

December 2001 has been a significant factor in international trade growth since that time, when trade growth has been broadly double the rate of economic growth.

Figure 5.1: Annual change in volume of world merchandise trade and GDP, 2000-07



Source: WTO (2008)

The implications of the changing global economic circumstances since the end of this time series are discussed in Section 5.4.

5.2 Trends in container freight transport

It is estimated that 828 million tonnes of freight were moved in containers globally by sea in 2007, using 118 million TEU of containers (DfT, 2008a). By contrast, in 1996 just 332 million tonnes of goods had been moved in 42 million TEU of containers. This represents an increase of 150% in just 11 years, or a compound annual growth rate of 9%. Global container trade is dominated by three corridors, all of which involve the UNECE region. Table 5.2 summarises the recent growth on these three corridors, those being the links between Asia, Europe and the USA. Some caution should be exercised when interpreting these figures since, despite the same method being adopted by UNCTAD throughout the time period, consecutive reports contain varying figures for the same corridor in the same year as a consequence of the estimation process. The most historic figure for each year has been adopted since these are likely to have higher accuracy; this means that the 2007 figures in particular should be treated with caution. The growth in containerised trade from Asia has been dramatic, particularly on the corridor to Europe. There have also been large increases from Asia to the USA and from Europe to Asia, while other corridors have witnessed more modest growth rates. Overall, there has been a 150% increase in containerised volume on these corridors between 2000 and 2007, which has considerable implications for port operations and hinterland transport activity. The growing imbalance of containerised trade in absolute terms on all corridors, but particularly the two involving Asia, adds to the requirement to maximise transport efficiency due to the large number of containers being moved over long distances with little or no revenue generation.

Table 5.2: Estimated containerised cargo flows on major trade routes (million TEU)

	Transpacific		Europe-Asia		Transatlantic	
Year	Asia-USA	USA-Asia	Asia-Europe	Europe-Asia	USA-Europe	Europe-USA
2000	5.6	3.2	4.5	3.6	2.2	2.9
2001	7.2	3.9	5.9	4.0	2.7	3.6
2002	8.8	3.9	3.9	6.1	1.5	2.6
2003	10.2	4.0	7.3	4.9	1.7	2.9
2004	12.4	4.2	8.9	5.2	1.7	3.2
2005	12.4	4.4	10.8	5.5	2.1	3.8
2006	15.0	4.7	15.3	9.1	2.5	4.4
2007	15.4	4.9	17.7	10.0	2.7	4.5
% change 2000-07	*175*	*53*	*293*	*178*	*23*	*55*

Source: UNCTAD (2008b) and earlier editions

To cater for this growth in containerised traffic, as Table 5.3 shows, there has been massive expansion in the container ship fleet. The number of vessels increased by more than four times between 1987 and 2008, with the fleet capacity increasing almost tenfold in the same period, reflecting the trend towards larger vessels.

Table 5.3: Long-term trends in the cellular container ship fleet (vessels of 100 GT and above)

World total	1987	1997	2006	2007	2008	Annual % growth 2007-2008
Number of vessels	1,052	1,954	3,494	3,904	4,276	9.53
TEU capacity	1,215,215	3,089,682	8,120,465	9,436,377	10,760,173	14.03
Average vessel size	1,155	1,581	2,324	2,417	2,516	4.11

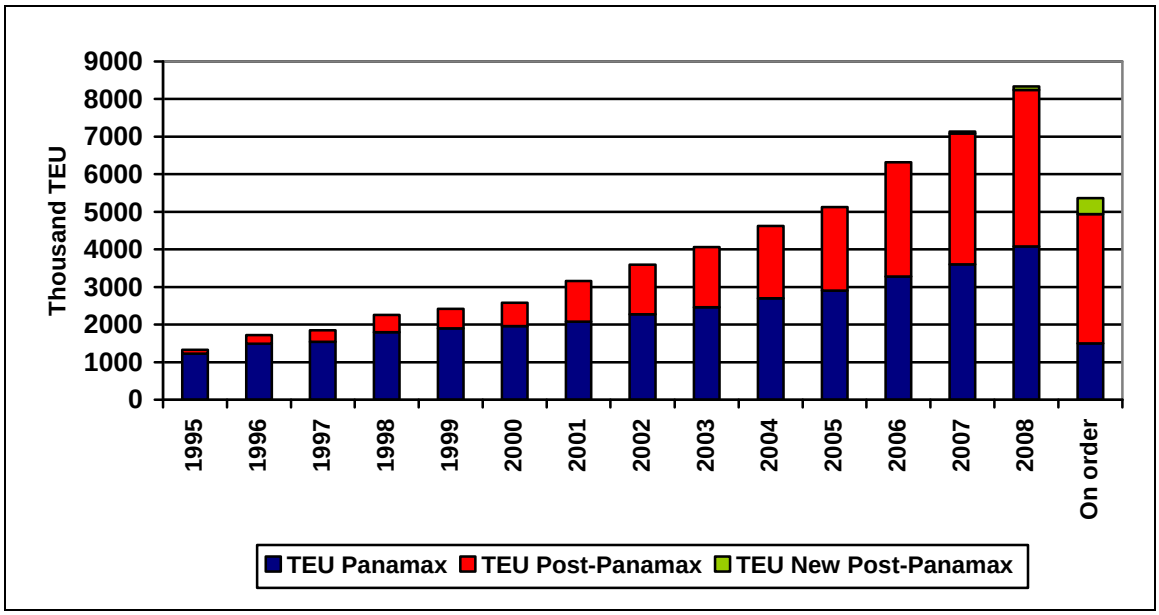
Source: UNCTAD (2008b)

The data in Table 5.3 include relatively small container vessels, as small as 100 gross tons (GT). An alternative dataset focuses only on the larger vessels that are typically used on deep sea routes (DfT, 2008a). This reveals that there has been an almost fourfold increase in the number of 'Panamax' and 'post-Panamax' container vessels since 1995, but this has been outstripped by the growth in capacity provided (see Figure 5.2), reflecting the increase in average vessel capacity from 2,900 TEU in 1995 to 4,700 TEU in 2008. The increasing significance of the 'post-Panamax' vessels is evident, with a dramatically rising share of total capacity; this has implications for hinterland connections as a consequence of the more limited range of ports than are served and the typically larger quantities transferred from ship to shore (and vice versa) during each port call, which then have to be moved to/from the port's hinterland. Figure 5.2 also shows the additional capacity on the order book as at 2008.

In tandem with the trend towards larger container ships on deep sea corridors, there has been growing consolidation within the container shipping sector. The top 20 shipping lines increased their share of TEU capacity from 26% in 1980 to 81% in 2007 (Notteboom, 2008). The top 20 terminal operators have also increased their share of

throughput, though to a much lesser degree. They had 42% of the market in 1980, rising to 55% by 2007. Table 5.4 summarises the position in 2008 regarding the top 10 container shipping lines as measured by their fleet capacity (i.e. shipboard slots). This high level of consolidation, particularly with the emergence of the 'big three' has implications for port hinterland flows, since these big lines are increasingly powerful in global supply chains influencing the ports used, frequency and routing of services, etc.

Figure 5.2: Total TEU capacity of large container ships



Source: based on MDS Transmodal, in DfT (2008a)

Table 5.4: Top ten container lines by slot capacity

	Shipping line	Current ships	Current shipboard slots ('000 TEU)	Ship capacity on order ('000 TEU)	TOTAL ('000 TEU)	% share of top 10
1	Maersk Line	563	1,913	410	2,323	23
2	MSC	412	1,335	448	1,783	18
3	CMA-CGM	373	939	540	1,479	15
4	Evergreen	180	631	4	635	6
5	Hapag-Lloyd	126	479	105	584	6
6	Coscon	137	477	437	914	9
7	APL	123	442	133	575	6
8	NYK	131	419	151	570	6
9	CSCL	104	402	185	587	6
10	Mitsui OSK	111	371	174	545	5
	TOTAL	2,260	7,408	2,587	9,995	100

Source: based on MDS Transmodal, in DfT (2008a)

Table 5.5 reveals the recent trends in container throughput at the leading EU ports. The rapid growth in global containerised volumes has been reflected at the EU level, with 55% growth in TEU throughput at the top 20 ports between 2001 and 2006, and 20%

growth in just two years (2004 – 2006) at the main ports in the EU-27 plus Croatia and Norway. With just one exception, all ports have increased their throughput since 2000; the rate of growth has not been uniform, though, as the right hand column of the table reveals. Of particular note is the rapid growth of Hamburg and Antwerp, challenging Rotterdam's dominance, and high rates of growth at the Spanish ports included in the Top 20. Constanta has witnessed a threefold increase in just two years, most likely reflecting the inclusion of Romania in the EU from 2004 and the development of new maritime services coming in through Eastern Europe. The top three ports, all in the North West Europe region, account for approximately one-third of the total main port throughput; this has declined slightly since 2001, but still reflects a high degree of geographical concentration, with implications for hinterland flows.

Table 5.5: Top 20 EU container ports (2000 – 2006, TEUs handled)

2006 Rank	Port	Volume of containers handled (in '000 TEUs)							2000-06 change (%)
		2000	2001	2002	2003	2004	2005	2006	
1	Rotterdam (NL)	6,253	6,061	6,505	7,118	8,242	9,195	9,575	53
2	Hamburg (DE)	4,275	4,665	5,376	6,126	7,004	8,084	8,878	108
3	Antwerp (BE)	2,641	3,001	3,153	4,012	5,055	6,221	6,718	154
4	Bremen/Bremer-haven (DE)	2,643	2,972	3,032	3,191	3,529	3,741	4,504	70
5	Algeciras (ES)	:	1,737	1,732	2,024	970	3,184	3,262	:
6	Felixstowe (UK)	2,825	2,839	2,682	2,482	2,717	2,760	3,030	7
7	Gioia Tauro (IT)	2,575	2,393	2,883	3,094	3,170	3,123	2,835	10
8	Valencia (ES)	1,313	1,512	1,826	2,012	2,156	2,415	2,615	99
9	Barcelona (ES)	1,389	1,404	1,122	1,765	2,084	2,071	2,315	67
10	Le Havre (FR)	1,334	1,550	1,754	2,015	2,158	2,144	2,119	59
11	Southampton (UK)	1,092	1,213	1,275	1,375	1,435	1,384	1,502	38
12	Piraeus (EL)	1,096	1,164	1,395	1,606	1,551	1,401	1,413	29
13	Las Palmas (ES)	648	664	726	966	1,111	1,222	1,303	101
14	Constanta (RO)	:	:	:	:	391	867	1,170	:
15	Genova (IT)	1,179	1,536	1,499	1,591	1,437	1,038	1,146	(3)
16	La Spezia (IT)	661	758	780	836	879	916	1,086	64
17	Marseille (FR)	725	745	811	835	920	911	950	31
18	Bilbao (ES)	425	447	454	468	498	863	899	112
19	Zeebrugge (BE)	488	279	329	328	458	682	895	83
20	Goteborg (SE)	652	624	725	634	722	772	812	25
Total top 20 ports *		**:**	**36,588**	**39,168**	**43,706**	**47,380**	**53,077**	**57,028**	**:**
EU-27^ (main ports)		**:**	**:**	**:**	**:**	**61,670**	**69,527**	**74,217**	**:**

* - top 20 ports during the reference year concerned; composition of the top 20 changes over time; ^ - also includes Croatia and Norway

Source: based on Eurostat (2008a)

It is more challenging to obtain data of the same level of consistency and comprehensiveness for non-EU countries in the UNECE region. However, to provide an indication of container throughput at large ports in these non-EU countries, Table 5.6 brings together statistics from a range of different sources for all other ports that have throughput totals in the range covered by the top 20 EU ports. An additional 20 ports fell into this category in 2006, 16 of which were in the USA or Canada and thus not playing a role in the European and Central Asian market. Turkey, an EU candidate country, accounted for two of the remaining ports, with one each in the Russian Federation and Israel.

Table 5.6: Container throughput at selected non-EU ports in the UNECE region (2006)

Port	Volume of containers handled in 2006 (in '000 TEUs)
Los Angeles (USA)	8,470
Long Beach (USA)	7,290
New York/New Jersey (USA)	5,093
Oakland (USA)	2,392
Vancouver (Canada)	2,208
Savannah (USA)	2,160
Tacoma (USA)	2,067
Hampton Roads (USA)	2,046
Seattle (USA)	1,987
Charleston (USA)	1,968
San Juan (USA)	1,729
Houston (USA)	1,606
St. Petersburg (Russian Federation)	1,450
Ambarli (Mardas) (Turkey)	1,446
Montreal (Canada)	1,289
Honolulu (USA)	1,114
Haifa (Israel)	1,053
Miami (USA)	977
Port Everglades (USA)	864
Izmir (Turkey)	848

Source: AAPA (2007), UNCTAD (2008b), Port of Hamburg (2009)

Table II in Appendix 2 shows the UNCTAD Liner Shipping Connectivity Index (LSCI) for UNECE countries for the 2004 – 2008 period. This index is explained in the Review of Maritime Transport (UNCTAD, 2008), but essentially uses a number of different variables to measure the extent to which each country is integrated into the global liner shipping network. Five of the top 10 countries in 2008 were UNECE members; this had also been the case in 2004, although the relative performance of the countries had changed with Germany and the Netherlands improving their rankings at the expense of the USA and the United Kingdom. This is also apparent for the remainder of the LSCI, with a number of countries dramatically improving their performance while others have suffered a decline in their score and, as a consequence, their ranking. There is a noticeable cluster of countries with high LSCI scores and then a large drop off in scores (in 2008) after France, with only Italy have a score between 66 and 36. This is further evidence of the level of concentration of activity, with consequent implications for hinterland flows.

There is little coordinated quantified information available relating to the nature of hinterland transport activity for container flows. Table 5.7 presents data for a number of major north European ports, which includes five of the top 10 European container ports. Typically, as container throughput decreases the share for road increases, reflecting the limited opportunities to consolidate the larger volumes on particular corridors that are normally required to allow viable rail or barge movement to/from a port's hinterland. It is also evident from the UNECE questionnaire responses that there are considerable variations in mode share for other ports, though road tends to be dominant for container movements: the implications of this are considered in Section 6. Transhipment from deep sea to feeder services is more significant at some ports, notably Hamburg and

Bremerhaven, than elsewhere, and Rotterdam and Antwerp are able to make use of their inland waterway networks to achieve a relatively high share for that mode.

Table 5.7: Modal split at major north European container ports (as % of port volumes)

	Road			Rail			Barge			Transhipment		
Port	**1998**	**2001**	**2003**	**1998**	**2001**	**2003**	**1998**	**2001**	**2003**	**1998**	**2001**	**2003**
Rotterdam	39.0	37.5	40.0	11.0	10.0	8.0	26.0	30.0	32.0	24.0	23.0	20.0
Hamburg	45.1	43.6	41.8	19.1	17.9	17.2	0.1	0.9	1.0	35.7	37.6	40.1
Antwerp	57.1	53.1	50.0	6.9	7.6	8.0	24.5	25.9	26.0	11.5	13.4	16.0
Bremerhaven	31.4	27.9	33.0	16.0	16.2	15.0	0.9	0.9	1.0	51.7	55.0	51.0
Le Havre	73.0	67.8	57.4	12.3	9.1	8.6	1.1	2.5	3.3	13.7	20.5	30.7
Zeebrugge	50.4	45.4	52.6	34.3	39.0	38.4	15.0	8.6	4.5	0.4	7.0	4.5
Dunkirk	90.0	82.5	76.7	9.0	13.5	20.5	1.0	4.0	2.7	0.0	0.0	0.0

Source: based on Ocean Shipping Consultants, in ESPO (2004)

Using the UNECE questionnaire responses, Table 5.8 summarises the respondents' views of the current performance of the different transport modes. The number of observations relating to each mode generally reflects the existence of infrastructure and services for that mode, with road being ubiquitous but far fewer ports having experience of inland waterways, for example. The standard deviation values are generally high, reflecting widely varying opinions from different ports. To try to determine whether groups of similar ports show more similar values, Table I in Appendix 2 provides disaggregation of the respondents into three categories: ports from the established (i.e. pre-2004) EU-15 countries (10 ports); ports from the new EU entrants plus the Russian Federation and Ukraine (8 ports); and the Turkish ports (13 ports). Small numbers of respondents in each category rule out any detailed statistical analysis, but standard deviations remain relatively high so there is considerable variability within the port categories. Port throughput does not appear to have a consistent influence, suggesting that the hinterland conditions tend to be port-specific. Generally, road is viewed as performing better than the alternative modes, except in the EU-15 category where there is little difference between any of the modes' average score. Issues relating to transport mode for container hinterland flows are explored in greater depth later in the report.

Table 5.8: Extent to which transport modes currently satisfy the requirements of container flows through the port

	Road	**Rail**	**Inland waterway**	**Short sea shipping**	**Coastal shipping**
Average	7.9	6.7	5.5	7.2	6.8
Standard deviation	1.83	2.62	2.73	2.82	2.90
No. of observations	30	23	8	11	12

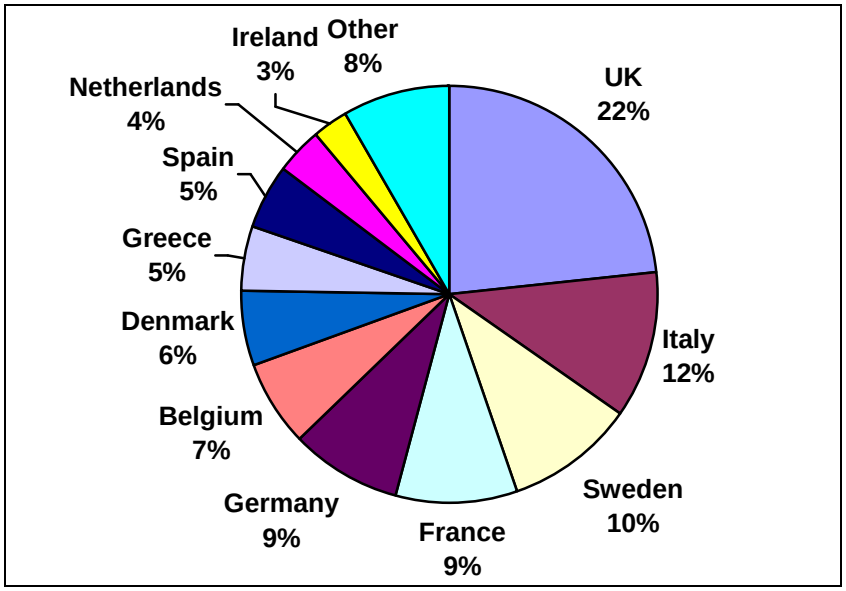
Source: UNECE questionnaire (for average, 1 = very inefficient, 10 = very efficient)

5.3 Trends in freight transport by ferry

In contrast to the container market, there is less by way of consistent statistical information and analysis relating to freight transport by ferry, particularly for non-EU countries. The European Sea Ports Association (ESPO) summarises official statistics in its Annual Report, revealing a total of just over 450 million tonnes of ro-ro traffic in the EU (plus Croatia and Norway) in 2006. Figure 5.3 shows that one-third of this tonnage

passes through UK and Italian ports, with seven other countries accounting for a further 50% of the total. Table 5.9 reveals the top 20 ports, the largest 12 of which are all located in northern Europe.

Figure 5.3: Distribution of ro-ro traffic by EU country (and Croatia and Norway) (2006)



Source: based on Eurostat data in ESPO (2008)

Table 5.9: Ro-ro traffic handled in top 20 EU ports (2006)

Port	Ro-ro total ('000 tonnes)
Dover	23,354,523
Calais	18,489,151
Lübeck	16,968,292
Zeebrugge	16,873,582
Immingham	14,048,374
Göteborg	12, 017,356
Trelleborg	11,205,119
Dunkerque	11,091,142
Rotterdam	10,837,161
London	9,035,415
Dublin	8,943,694
Rostock	7,880,188
Genova	7,796,509
Palma Mallorca	7,504,345
Liverpool	6,734,603
Oostende	6,289,604
Livorno	6,144,820
Rødby	5,755,100
Helsinki	5,616,599
Antwerp	5,497,731

Source: based on Eurostat data in ESPO (2008)

In addition, it is evident from the questionnaire responses that there is considerable ro-ro traffic passing through Turkish ports, particularly in the Sea of Marmara region connecting the Istanbul area with other parts of Turkey. There is also noticeable activity at Black Sea and Mediterranean ports, although this is on a much smaller scale. No attempt has been made to assess the importance of ferry activity in North America.

5.4 Container and ferry freight transport projections in the UNECE region

Most projections for future traffic volumes seem to be predicated on a continuation of the recent high growth trends. For example, the EU White Paper (European Commission, 2001) assumes large scale continued trade growth and aims to implement policies to allow this to happen with reduced environmental and social impacts. Cariou (2008) reports that most analysts at the time predicted rapid further growth in containerised trade, with forecast growth rates of between 6 and 8% for the following 15 year period. Detailed forecasts for both container and ro-ro traffic were prepared for the British government in 2006, and these are shown in Table 5.10: it is clear that consistent growth was forecast for both flow types.

Table 5.10: Forecast Great Britain containerised and ro-ro traffic (2004-2030)

	2004	**2010**	**2015**	**2020**	**2025**	**2030**	**Annual growth (%)**
Containers ('000 TEU)	7,086	10,009	12,146	14,167	16,633	19,728	3.75
Ro-ro units ('000 units)	7,637	9,390	10,911	12,640	14,460	16,159	2.92

Source: MDS Transmodal (2006)

Further supporting the expectation of continued growth, it was seen in Figure 5.2 that the order book in 2008 for new large container ships was significant, estimated to be more than 5 million TEU in total compared to the 2008 capacity in large container ships of approximately 8.2 million TEU. UNCTAD (2008c) estimated the order book in May 2008 to be even greater, totalling 1,528 ships with a total capacity of 6.7 million TEU. In addition, many of the major ports have plans to expand their capacity and, as a result, the throughput of containers and or ro-ro units, and a number of new port developments are planned for these traffic types. There appears to be little coordination of such planned expansion at the international level and, in many cases, not even at the national scale.

The current economic slowdown is already showing these trade projections, and associated ship order books and planned port developments, to be overestimated. It appears that the prevailing global conditions have reversed the longstanding growth trend for trade, with containerised traffic being badly hit. The WTO (2009) is predicting a reduction of approximately 9% in trade volumes in 2009, while Lloyd's List (2009) has reported considerable overcapacity in the container shipping sector, with 11% of container vessels laid up due to a lack of work by March 2009. Where possible, shipping lines are cancelling or deferring as much of the additional ship capacity on order as possible. Similarly, examples have been reported of new or expanded port developments being put on hold or implemented more gradually than planned. While the economic slowdown may be a relatively short-term phenomenon, the impacts of climate change policies (and legislation) and fossil fuel availability (and price) may result in a long-term break from the growth trend.

Table 5.11 reveals the expected changes in the performance of the various hinterland transport modes among the UNECE questionnaire respondents. Care needs to be taken in interpreting these results, particularly for the water-based modes where the number of respondent observations is more limited, but in all cases the average is greater than 5.5, meaning that the performance is expected to improve. All of the modes have mean values in the range of 7.1 to 8.1, meaning that fairly considerable improvements are expected, but with no one particular mode expected to improve significantly more than the others. When disaggregated into the same three categories as before (see Table I in Appendix 2) it is evident that road improvements are anticipated to show less improvement in the established EU countries than in the other two categories. By contrast, rail improvements are predicted to be very similar across the range of categories, while there are insufficient sample sizes for the other modes to allow any differences in opinion to be inferred. From the responses to the final question in the questionnaire, it is clear that many of the port authorities anticipate quite significant improvements to transport infrastructure both within their port area and on the wider hinterland transport networks.

Table 5.11: Extent to which performance of transport modes is likely to change in the next 10 years for container flows through ports

	Road	Rail	Inland waterway	Short sea shipping	Coastal shipping
Average	8.0	8.0	7.1	8.1	7.5
Standard deviation	2.07	1.67	2.73	1.69	1.92
No. of observations	29	26	10	14	15

Source: UNECE questionnaire (for average, 1 = become much worse, 10 = become much better)

5.5 Summary

This section has examined the key information concerning container and ferry activity in the UNECE region. The significant growth in containerised trade has been highlighted, together with the expectation, until recently at least, of sustained growth for the foreseeable future. A distinct trend towards ever-larger container ships has been noted, which has implications for the number of units brought ashore or collected during port calls, which in turn influences the use of the hinterland connections. The importance of ro-ro traffic in certain areas has also been identified. Of note is the limited overlap between the largest container and ro-ro ports; in the EU, only four ports (i.e. Rotterdam, Antwerp, Genova and Zeebrugge) are common to the top 20 for each category, reflecting the high degree of port specialisation that exists nowadays. Key issues relating to recent trends and future prospects and challenges for port hinterland flows are considered in Section 6.

6. Key issues and challenges

6.1 Introduction

It is important to recognise that measures to influence hinterland transport operations must take the existing situation as their starting point. As the World Bank (2005) identified, transport corridors tend to have a long history either as well-established international trading routes or as a series of nationally-focused routes that have been woven in to a corridor in more recent times. Interactions with other types of transport activity, such as long-distance passenger traffic or local flows of freight and people, are inevitable and may affect the performance of hinterland connections even where they have greater importance as is planned for the EU's priority rail freight network. This tends to be less of an issue for water-based transport modes where other flows generally do not compete for access to scarce infrastructure capacity.

The lack of a blank canvas for designing and managing hinterland connections will influence the range of options available for implementation, and the varying characteristics of different corridors will mean that the implementation of standardised measures will not have a consistent impact across the UNECE region. That said, this section intends to develop an insight into the key issues and challenges for hinterland connections at a general level, and to identify good practice examples for achieving efficient and sustainable hinterland goods movement. It does this through the analysis in response to a series of questions which have been formulated to help to address the study's objectives:

- How can port hinterland transport performance be measured?
- What is the relative performance of the different transport modes used for hinterland flows?
- To what extent are landlocked countries disadvantaged by their lack of direct access to sea ports?
- How well do existing data sources satisfy the requirements for analysing port hinterland transport flows?

6.2 Measurement of hinterland connection performance

There is no agreed standard means of measuring hinterland connection performance, and data availability and consistency issues make international comparison different. Essentially, hinterland performance can be considered at the macro (country) or micro (port or corridor) level. For the former, there is no standard international comparator of hinterland connections, but the World Bank and the World Economic Forum provide high level global country comparisons for logistics activities that aim to quantify countries' performance; inevitably, this incorporates hinterland links, although it is not possible to consider their performance in isolation. Three indices are particularly significant for this research. The Logistics Performance Index (LPI) and Trading Across Borders indices are produced by the World Bank, while The Enabling Trading Index is the work of the World Economic Forum.

The LPI is a measure of 'logistics friendliness' for each country. It is based on responses from freight operators to a questionnaire which examines national and cross-

border logistics performance, comprising a mix of objective and subjective information. The most recent LPI, for 2007, has three key components (World Bank, 2007a):

- Perceptions of the logistics environment of trading partner countries: efficiency and effectiveness of customs and other border procedures; quality of transport and IT infrastructure; ease and affordability of arranging shipments; competence in the local logistics industry; ability to track and trace shipments; domestic logistics costs; timeliness of shipments in reaching destination (data for 150 countries)
- Information on the logistics environment in the home country of operation: direct freight costs; quality of transport and IT infrastructure; competence in the delivery of input services logistics operators need; performance of the clearance process of exports and imports; constraints affecting logistics performance; trends (data for 110 countries)
- Real time-cost performance data for country of operation: number of border agencies; customs performance indicators; percentage of damaged shipments; lead times to export and import (data for 100 countries)

The LPI outputs are expressed using scores for seven key factors; the scores for the UNECE countries are presented in Table III in Appendix 2, where the countries are listed according to their global ranking (see left hand column) for their overall LPI score. 48 of the 56 UNECE countries are included in the LPI, with certain Central Asian and small European countries omitted. While the methodology involves a certain degree of subjectivity, the results are informative and reveal considerable differences between countries in the overall LPI scores, together with variability in specific factors. Of the seven factors, all potentially can be linked in some way to hinterland transport and it is difficult to clearly identify the role of each one. There is generally a high correlation between the set of factors, with scores gradually decreasing down the rankings. The 'domestic logistics costs' factor is somewhat an anomaly, with a more erratic pattern and less overall variability than for the other factors. In broad terms, the rankings are as expected with the traditional EU countries, plus other long established developed countries such as the USA, Canada, Austria, Switzerland and Norway, scoring more highly than the emerging economies further east in the UNECE region.

As its name suggests, Trading Across Borders focuses specifically on the procedures necessary for exporting and importing goods (World Bank, 2008b). The database covers 181 economies, including 49 UNECE countries, and adopts a standardised methodology for identifying the cost and time associated with transporting a loaded standard 20' container from factor to port of exit for exports and from port of entry to distribution centre for imports, together with the official documentation necessary to meet all customs requirements. Table IV in Appendix 2 shows the results for each UNECE country included in the database. The Enabling Trade Index 2008 (World Economic Forum, 2008) has a similar intention, includes 118 countries and comprises four sub-indexes which cover market access, border administration, transport and communications infrastructure and business environment. 45 UNECE countries are represented in the index. The data in the report are sourced from approximately 25 different sources (national authorities, international agencies and private sources), together with an Executive Opinion Survey. Table V in Appendix 2 presents the rankings and scores for the UNECE countries. As with the LPI, the established economies tend to perform much better in these indices than do the emerging economies in the EECCA region.

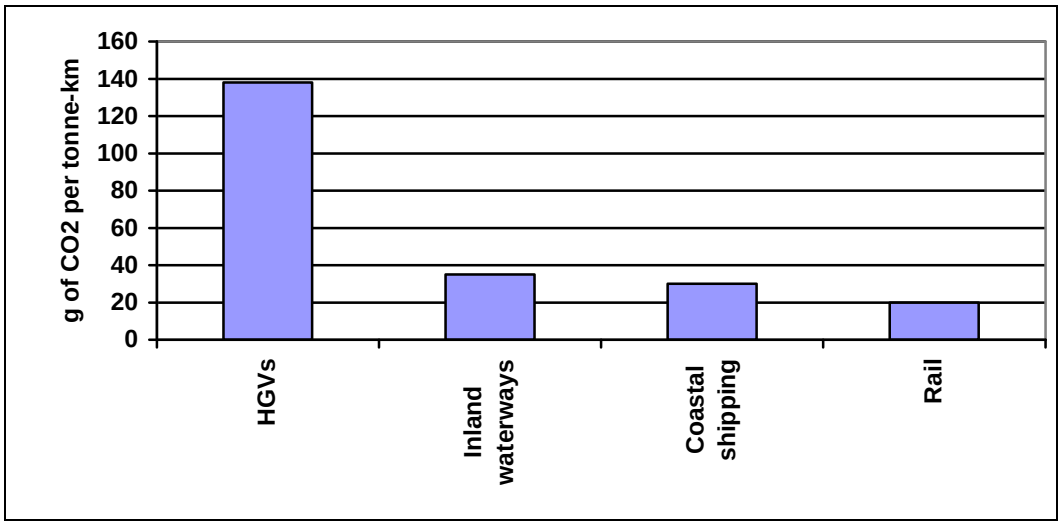
There is no consistent analysis of hinterland connections at the individual port or corridor level. Individual ports typically measure their hinterland performance in terms of their connectivity to inland locations through measures relating to the number of inland terminals served and the frequencies, journey times and/or quantities of goods flowing to these terminals or geographical areas. The World Bank (2005) has attempted to define a Corridor Service Analysis, based on three key perspectives: infrastructure, service quality and goods movement. Cost and time factors can be represented graphically for ease of comprehension. In considering port hinterland connections, it is imperative to consider more than just the existence of physical infrastructure. Infrastructure attributes, such as speed, capacity and quality, are important, as are the wider transport performance measures that affect supply chain decision making, such as transit time variability and in-transit risk. Measures relating to environmental performance are increasingly important.

6.3 Relative performance of transport modes

The third study objective makes specific reference to the importance of sustainable hinterland movements. As Section 2 discussed, this has become a much more significant political issue in recent years as concern about climate change and energy supplies has grown. The concept of comodality developed by the EU is an important one in attempting to assess the role of the different modes of transport: the optimal and sustainable use and combination of the various modes of transport.

A number of studies have attempted to assess the relative environmental impacts of different freight modes. The picture that emerges from these various studies is generally consistent, despite some differences in absolute values, and supports the longstanding EU policies which generally have aimed to shift freight away from road to more sustainable transport modes. A recent thorough assessment by McKinnon (2007) identified clear benefits of rail and water movement over road haulage, as shown by the comparison of average CO_2 intensity values for the four modes available for onward distribution of containers from hub ports to hinterland destinations (see Figure 6.1).

Figure 6.1: Estimated average CO_2 intensity values for freight transport modes



Source: adapted from McKinnon (2007)

It is important not to lose sight of the bigger picture by focusing solely on specific links of long distance intercontinental supply chains, since efficient individual supply chain legs do not necessarily combine to make an efficient complete supply chain. As far as is practical, therefore, it is beneficial to consider end-to-end flows in a structured manner, identifying the weakest links in sustainability terms and determining improvements that can reduce overall environmental impacts. These improvements may be to specific legs of the supply chain (e.g. mode shift) or may involve a redesign of the supply chain's structure.

In addition, it must be borne in mind that these figures are averages, and in reality the CO_2 intensity will be heavily influenced by the characteristics of the flow, such as the number of containers to be moved and the efficiency and speed of the transport operation. Attention is increasingly turning to the identification and examination of a range of factors that influence the energy consumption and associated emissions for different types of freight flow, to gain a better insight into the variability of energy and environmental performance. An early study, conducted by IFEU/SGKV (2002), investigated in some detail the energy use and associated CO_2 emissions for road alone and combined rail and road using intermodal technologies for a number of established transport corridors for door-to-door flows. Less significant factors were shunting operations, intermodal transfers and terrain. Of the 19 corridors considered, six showed combined transport CO_2 emissions to be less than 50% of the equivalent road value per unit carried, seven were between 50% and 80% of the road total and the final six were from 85% to 103% of the road emissions. Quite clearly, though, this study reveals that considerable variability in the performance of intermodal road/rail. The most significant factor influencing the emissions was found to be the energy source. Other highly rated factors were the unladen weight, the payload/tare weight ratio, the load factor, and distance/deviations. While the focus on specific real world flows helps to ensure that the data are representative, a number of assumptions are necessary for such analyses, and these can significantly influence the outcomes. Of course, the relative performance of different transport mode options may change over time due, for example, to the introduction of new regulations or technologies.

There is some evidence that ports themselves are developing initiatives to improve supply chain sustainability. For example, The World Ports Climate Declaration (C40 Cities, 2008) recognises that ports are hubs in global supply chains, placing them in a position where they may be able to influence environmental performance. One section of the Declaration deals with hinterland transport, with three measures identified:

- Use efficient and innovative logistics to lower the requirement for hinterland transport
- Encourage and facilitate modal shift towards clean end energy efficient transport modes
- Stimulate improvements in the environmental performance of all transport modes

In addition, at the port level, it is intended that quantification, target setting and auditing of ports' CO_2 footprints will be required of those ports signing up to the Declaration.

6.4 Specific issues and challenges for landlocked countries

There are specific issues relating to the landlocked UNECE member countries, particularly those emerging economies in Central Asia. 20 UNECE countries are

landlocked, including one, Uzbekistan, which is double landlocked (i.e. none of its neighbouring countries have a coastline, so two other countries have to be traversed to reach a port). The indices presented in Appendix 2 and discussed in Section 6.2 (i.e. LPI, Trading Across Borders and the Enabling Trade Index) provide an indication of the difficulties encountered by landlocked countries, which are shown in red italics in each of the tables. Of the UNECE countries which are not included in any of the indices, four are landlocked (i.e. Andorra, Liechtenstein, San Marino and Turkmenistan). In addition, it should be noted that Bosnia and Herzegovina has no significant coastline or freight port. There is a fairly strong relationship whereby landlocked countries are generally ranked lower in both indices than countries with a coastline. Further, there is a noticeable difference between the Central European and Central Asian landlocked countries, with the former group generally performing far better than the latter. Thus while landlocked countries may suffer a general disadvantage, other factors related to the performance of transport systems and border crossings seem likely to reduce or increase the shortcoming of no direct port access.

The high costs of trading with and from the emerging Central Asian economies is demonstrated very clearly, with extremely high costs, slow transits and a large number of documents required. These problems have been recognised as inhibiting the development of these countries' economies and are being tackled by the Almaty Programme of Action (APA) and the transport facilitation work under the UN Special Programme for Economies of Central Asia (SPECA).

Border crossing performance is a major influence on the functioning of hinterland flows that cross international frontiers en route to/from ports, and this is a factor that necessarily is faced by landlocked countries. Obstacles at border crossings have a disproportionate effect on such countries since they do not have direct access to one or more seaports without crossing a land frontier, whereas countries with a coastline have the opportunity to develop direct shipping services in theory at least. A number of institutions, including the World Bank (2008b) and the World Economic Forum (2008), have focused their attention on this issue, attempting to quantify the issues and rank country performance: this will be discussed later in the report. Many of the problems are administrative (Ranger, 2009), relating to the efficiency and transparency of procedures, but others relate to transport infrastructure and service capabilities (e.g. lack of interoperability of rail infrastructure and operating systems). While many administrative obstacles have now been resolved within the EU, significant problems remain at other border crossings, with regular delays of 12-24 hours (or more) at road crossings to/from Russia, for example. Pekalis (2009) reported average queue lengths of 700 goods vehicles at one Latvian-Russian border crossing in 2007, though this had reduced to 410 vehicles in 2008. Such delays can have significant impacts on the reliability of supply chains, not least because of the unpredictability of the extent of crossing delays. In general terms, however, road border crossings appear to be less problematic than rail ones, where there are inherently greater obstacles to international interoperability. Examples of initiatives that reduce border crossing delays and uncertainty are identified in Section 7.

6.5 Data availability and quality

The continued expansion of the EU has led to a greater number of UNECE countries adopting the standardised Eurostat data collection methods. Table 6.1 summarises the range of relevant data that are currently collected by Eurostat.

Table 6.1: What EU data are currently collected?

Mode	Legal basis	Data on port hinterland?
Sea freight	Dir. 95/64/EC	Goods loaded and unloaded in ports, by type of cargo, origin/destination overseas
Road freight	Reg. 1172/98	Goods loaded and unloaded in NUTS-3 regions, by type of goods and cargo (sample)
Rail freight	Reg. 91/2003	Goods loaded and unloaded in NUTS-2 regions every 5 years; country level type of goods and cargo
Inland waterways freight	Reg. 1365/2006	Goods loaded and unloaded in NUTS-2 regions; type of goods and container
Air freight	Reg. 437/2003	Goods and mail loaded and unloaded at airports; origin/destination airports

Source: Eurostat (2009a)

According to Eurostat, the following information relating to intermodal transport activity is missing on a coordinated basis:

- Previous or next mode of transport for intermodal units (i.e. containers, swap bodies and semi-trailers), which would allow flow visibility along the transport chain rather than on an individual leg by leg basis
- Transhipment terminal performance (e.g. waiting times)
- Criteria related to mode choice, allowing informed decision making about ways in which rail, inland waterway and sea transport can be made more attractive to complement road haulage

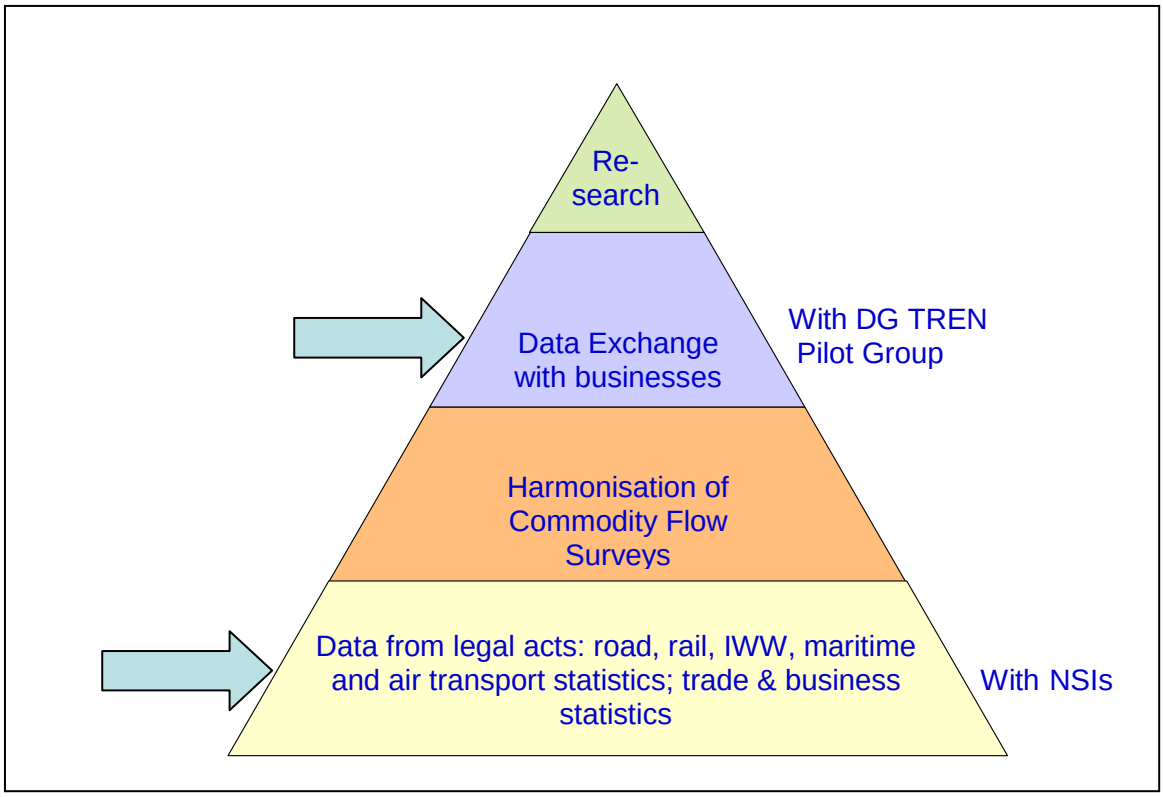
Despite these shortcomings, Eurostat periodically publishes a short statistics document focusing on the unitisation of freight transport in the EU (Eurostat, 2008b). Data availability issues mean that an incomplete picture is provided, even for basic measures such as mode share (Eurostat, 2008b). For example, data for inland waterways are not available at all, and a number of countries are unable to provide unitised transport statistics for road and rail. Where comprehensive national statistics do exist, the methodologies often differ, which makes international comparison difficult.

Figure 6.2 shows the strategy that Eurostat has developed to further improve knowledge of intermodal transport movements, building on the data that come from the legal acts mentioned previously. In addition to work on harmonising commodity flow surveys within the EU area, efforts are being made in conjunction with DG TREN to identify ways in which additional data can be collected from businesses. Eurostat is also working with various other organisations (including UNECE) to research the possibilities for making further improvements. The ultimate aim is to move towards the collection of logistics and comodality indicators rather than intermodal transport statistics, with the former being designed to provide a better understanding of goods flows rather than transport activity alone. To do this, it is hoped that agreement can be reached about the needs for and uses of additional statistical data.

Of course, individual UNECE countries, both in the EU and elsewhere, collect and publish their own data. For example, a number of countries (e.g. Sweden, France, US) conduct commodity flow surveys or shippers surveys in addition to publishing modally based transport statistics, thus enriching the understanding of goods flows. However,

such surveys are typically burdensome, with Eurostat (2009a) estimating that the US survey requires approximately 805,000 hours of input. A key issue relating to country-specific datasets is the difficulty in undertaking country comparisons due to the lack of consistency over methodology, time period, data coverage, etc.

Figure 6.2: Eurostat's strategy for intermodal transport statistics



Source: Eurostat (2009a)

6.6 Summary

Through the consideration of the four questions posed at the start of this section, the discussion has identified and discussed a number of issues that are key to the understanding of port hinterland performance. In many cases, imperfect knowledge and the lack of consistent, good quality data hinder the detailed understanding of the effects of different factors on the performance of hinterland transport. In the next section, good practice examples are highlighted.

7. Good practice in port hinterland flow efficiency and sustainability

7.1 Introduction

This section presents a range of important 'good practice' initiative of efficient and, often, more sustainable hinterland freight movement. The intention is to highlight a selection of examples that feature good practice in different aspects of hinterland connections, and which could form part of a toolkit of measures to be adopted in different situations and locations, as appropriate. For the purposes of presentation, the initiatives have been grouped into six themes, which are:

- Initiatives to satisfy trade requirements while minimising transport distance
- Hinterland transport infrastructure provision and use initiatives
- Initiatives to make efficient and sustainable use of transport modes
- Cross-border transport initiatives and the development of partnerships
- Non-transport initiatives to reduce border crossing delays
- Data availability

The allocation of initiatives to themes is in some cases fairly arbitrary, given the considerable overlap between themes. Some of the initiatives may be contradictory, and this is discussed in Section 8. Each of the themes is dealt with in turn in this section.

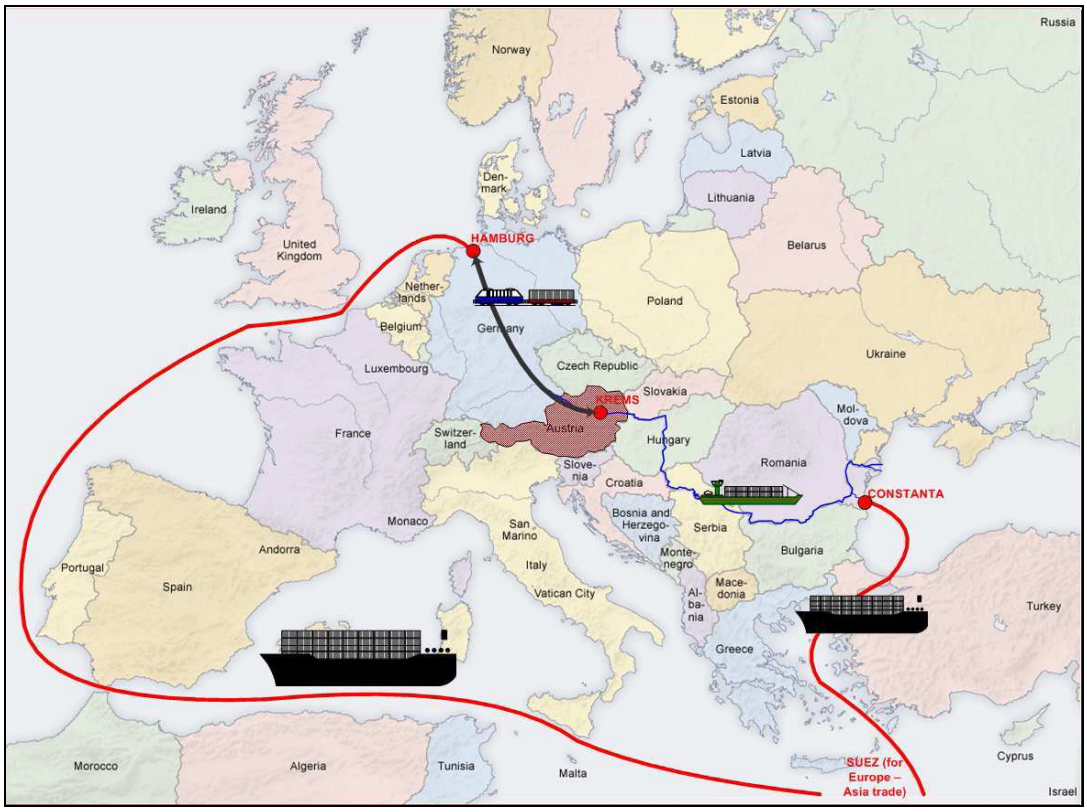
7.2 Initiatives to satisfy trade requirements while minimising transport distance

A key objective of freight transport activity and organisation may be taken to be to satisfy the requirement to move goods from origins to destinations with the generation of the minimum amount of transport activity. At its most simplistic level, this may be represented by the minimisation of transport distance, as with the basic concept of 'food miles'. Care needs to be taken, though, not to assume that a reduction in transport distance necessarily equates to an improvement in efficiency and a reduction in environmental impacts. Other good practice initiatives later in this section highlight the range of other variables that influence efficiency and sustainability along an entire supply chain.

Good practice: Container Line Service (COLD)
(Source: COLD (2006))

As a landlocked central European country, Austria is currently heavily dependent on hinterland connections to North West European ports. For flows from Asia, sea to Hamburg and onward rail movement from there to Austria is typical. The COLD study examined the feasibility of an alternative routing from Asia via Constanta and the Danube river. Figure 1 shows the European legs of these two routes. In comparing the traditional route with the proposed alternative route, the COLD study identified that the total transit time via Constanta would be the same as, or perhaps slightly less than, the existing journey duration via Hamburg. In addition, the study predicted that CO_2 emissions per container would be 16% lower, and total supply chain costs would reduce by between 10% and 20%. Of course, these outcomes are dependent on the nature of alternative services provided; the study was necessarily reliant on making a number of assumptions related to key criteria. Subsequent examples of good practice, together with the discussion in Section 8, return to consider these issues.

Figure 7.1: Alternative supply chain route between Asia and Austria via Danube and port of Constanta



Good practice: direct rail services from China to Europe
(Source: Deutsche Bahn AG (2008))

Responding to the increasing trade volumes between China and the European Union, a trial container train operated in January 2008 between Beijing and Hamburg conveying a range of consumer goods. The overland distance by rail was approximately 40% of the typical sea distance. The 10,000 kilometre rail journey through six countries (China, Mongolian Republic, Russia, Belarus, Poland and Germany) took 15 days, compared to a 35 day typical duration by sea. As a consequence of the successful trial, plans are being developed to commence regular operations on this corridor by 2010 with a daily service envisaged. The combination of rail capacity constraints and a price premium for using rail, estimated to be 47%, mean that rail is unlikely to challenge shipping's supremacy between China and North West Europe, but there may be certain flows that would be attracted to a regular service. In addition, there may be considerable potential for overland rail flows from China to Eastern European and Central Asian UNECE members, where distance and time savings are more significant, and cost savings over sea plus hinterland transport may be achievable. For example, direct rail services between China and Austria may be a viable alternative to the sea and inland waterway combination identified in the previous good practice example. Dependent on the relative performance of sea and rail, considerable reductions in CO_2 emissions may be achievable by using the shorter overland rail route and emissions of other pollutants may also be lessened (see Section 7.4).

7.3 Hinterland transport infrastructure provision and use initiatives

Traditionally, hinterland transport requirements have not been separately considered at a strategic level or, where this has been done, it has typically been done on a port-specific or a mode-specific basis. There is evidence that this is starting to change, and hinterland flows are increasingly being considered across the different transport modes, either for countries/regions or on a corridor basis. In order to achieve greater efficiency and sustainability, it is important to think holistically about transport infrastructure provision and its use.

Good practice: coordinated rail infrastructure improvements to serve Russian ports (Source: Anon (2009a))

Given the geographical scale of the Russian Federation, with significant seaports in the North-Western, Southern and Far Eastern regions, there are considerable challenges in connecting these disparate regions to the key hinterland areas. The Russian Federation has developed extensive investment proposals which are expected to lead to 2.5 times more cargo travelling to/from Russian ports by rail in 2020 compared to 2007; it is not clear how much of this anticipated growth is of containerised goods. Taking the Southern (i.e. Azov-Black Sea and North Caucasus) region as an example, the proposals include the following infrastructure initiatives:

- New railway links, particularly to bypass bottlenecks
- Provision of double track on existing single track sections
- Route electrification
- New or reconstructed freight terminals and yards

Good practice: German Freight Transport and Logistics Masterplan (Source: BMVBS (2008))

Seaport hinterland transport in Germany is forecast to grow by 131% by 2025, almost double the projected growth for freight transport as a whole. In 2008, the government produced a detailed Masterplan for freight transport and logistics, which follows the principles of the EU Action Plan for Freight Transport and Logistics. The German plan has six main objectives:

- Making optimum use of transport infrastructure
- Avoiding unnecessary journeys
- Shifting more traffic to railways and inland waterways
- Upgrading more transport arteries and hubs
- Environmentally friendly and climate friendly transport
- Good working conditions and good training in the freight transport industry.

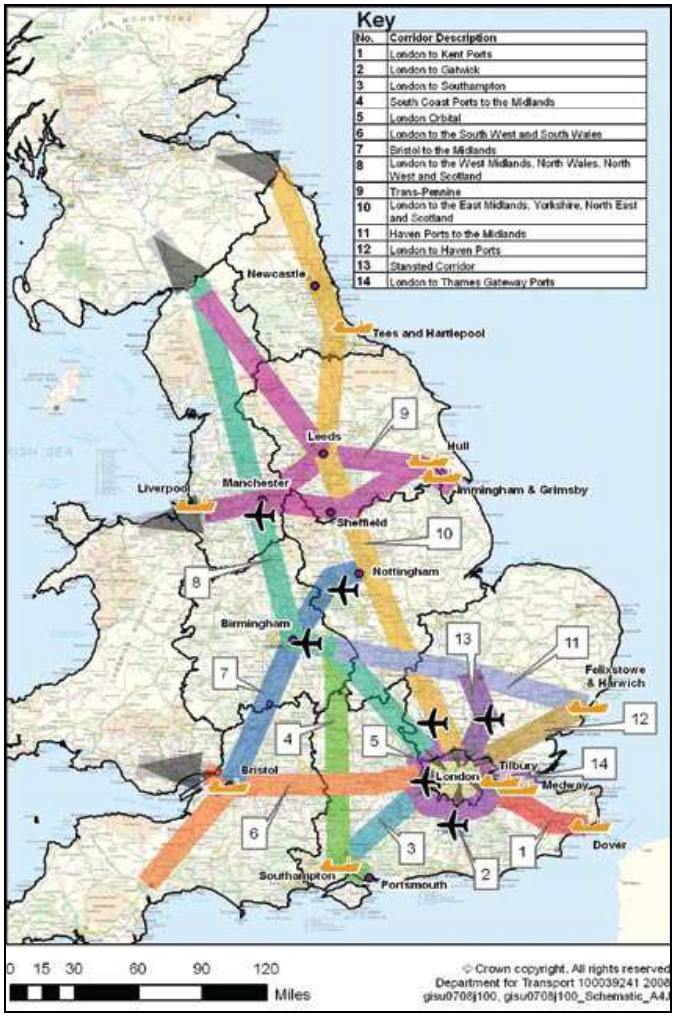
The overarching aim of the plan is to provide leadership and structure within the logistics sector, to ensure that sustainable mobility is achieved. The German government is to implement a national ports strategy, a key aspect of which will be coordinated investment in schemes that are important at the macroeconomic scale. Included in this will be priority treatment for key port hinterland links that are reaching saturation, with new and upgraded infrastructure being one possible solution where capacity is critical. However, the Masterplan adopts a holistic approach which also considers, for example,

the redistribution of flows to alternative modes and corridors, the greater adoption of IT solutions to better utilise the existing infrastructure, collaboration between seaports and logistics providers to reduce inefficiencies, and the use of measures to internalise the external costs of transport activity. Another proposed measure, consistent with EU policy, is to segregate freight and passenger transport activity, so that core routes can be developed that give priority to freight flows. In addition, the concept of comodality (and the associated importance of the integration of the different transport modes) is embodied in the Masterplan, with a focus on freight villages or logistics centres, the intention being that their consolidation and break-bulk activities will lead to more efficient transport utilisation for the various legs of supply chains, and with the use of the most appropriate mode of transport for each leg.

Good practice: English strategic transport corridors
(Source: DfT (2008b))

The UK government has adopted the EU focus on strategic transport corridors in its 2008 analysis of freight movement, identifying 14 strategic national corridors for England (see Figure 7.2); the concept of international gateways features strongly in the analysis.

Figure 7.2: Strategic national freight corridors for England



The two largest container ports (i.e. Felixstowe and Southampton) and the busiest ferry port (i.e. Dover) together being directly linked to five of the corridors, with indirect links to most of the others. In addition, other key ports such as Liverpool, Bristol and those on the Humber and Tees are linked in to the corridors. The corridors identified are seen as being crucial to the economic success of the UK, and investment decisions taken to enhance the corridors have the potential to reduce environmental impacts through the consideration of measures at a strategic level across the various transport modes.

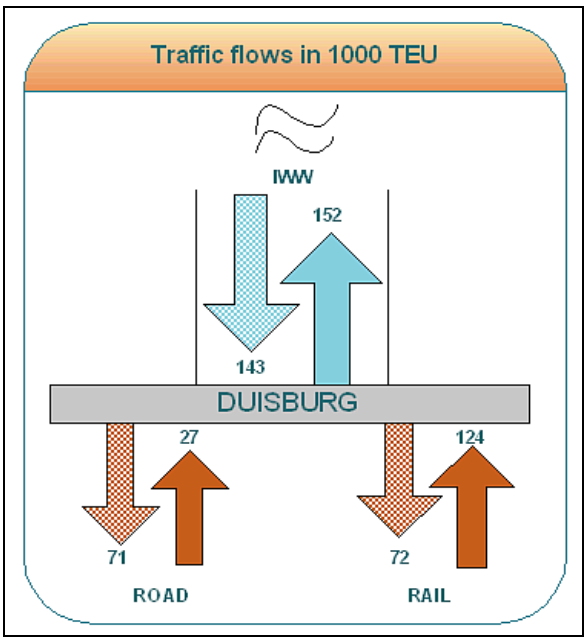
7.4 Initiatives to make efficient and sustainable use of transport modes

Following on from the previous sub-section, examples where the efficiency and sustainability of transport operations for hinterland flows have been improved are now identified.

Good practice: achieving comodality through the development of an 'inland port'
(Source: Eurostat (2008c))

Duisburg provides a good example of the 'inland port' concept, which demonstrates the applicability of the comodality concept (see Section 2.2). In this case, containers are moved inland from seaports using the River Rhine to the Port of Duisburg in the Rhine-Ruhr area of Germany. Duisburg has been successful in attracting sea-going short-sea vessels as well as inland waterway barges, considerably expanding the range of locations connected by waterborne transport modes. According to the port's website (http://www.duisport.de), there are short-sea container shipping line links to a number of UK ports, as well as barge services to both Rotterdam and Antwerpen. Figure 7.3 demonstrates that almost 300,000 TEU (two-way) were moved by water to/from Duisburg in 2005. Two-thirds of this volume used feeder rail services, meaning that road had a relatively low mode share.

Figure 7.3: Duisburg port traffic flows in 1000 TEU (2005)



Good practice: encouraging rail freight growth through market liberalisation
(Source: IBM Global Business Services (2007); Eurostat (2009b))

The EU sees the growth of international rail freight activity as a political objective, for economic, environmental and social reasons. Over the last decade, it has enacted a series of railway packages intended to liberalise the rail freight market, particularly concerning cross-border traffic. IBM has conducted an analysis of rail freight in EU countries (plus Norway and Switzerland), the aim being to identify and evaluate the extent to which each country has opened up its market. This is presented as the Liberalisation (LIB) Index for rail freight; the results of the 2007 study are shown in Table 7.1, revealing quite considerable experiences along the spectrum.

Table 7.1: European rail freight liberalisation and trends in rail freight activity

Country	**LIB Index 2007 (rail freight)**	**% change in rail freight tonne km (2004-2007)**
Sweden	908	12
Netherlands	887	24
Austria	852	14
United Kingdom	848	17
Switzerland	848	22*
Germany	844	33
Norway	836	21
Denmark	811	(12)
Czech Republic	798	8
Romania	797	(8)
Portugal	797	13
Poland	786	(1)
Spain	785	(7)
Belgium	780	2
Bulgaria	761	1
Slovakia	756	(1)
Lithuania	744	24
Slovenia	743	14
Hungary	740	16
Italy	734	14
Latvia	733	(2)
Finland	732	3
France	727	(7)
Estonia	727	(20)
Greece	690	41
Luxembourg	688	(49)
Ireland	458	(68)

Key to LIB Index: 1,000-800 – Advanced; 799-600 – On schedule; 599-300 – Delayed; * - 2004-2006 data

Of the eight countries identified as being advanced, seven witnessed double digit growth in rail freight volumes between 2004 and 2007. In many of these countries, container services to/from ports have been a major growth market. By contrast, Ireland, the sole delayed country, experienced a very substantial decline in activity during the same time period, and has seen a considerable contraction in container train operations in recent years. The majority of countries (18 in all) were classified as being on schedule. In this category, there was greater variability in the direction and magnitude of change in rail

freight volumes. While not conclusive, there is sufficient justification to claim that the opening up of national rail freight markets to competition is an important factor in achieving growth in activity.

Good practice: achieving high load factors
(source: author's research (in 2007))

Most freight transport operations fail to achieve 100% load factors (i.e. full capacity utilisation), resulting in available capacity being unused; this has impacts on unit transport costs and on environmental impacts, both of which have a large fixed component irrespective of load factor. For commercial and environmental reasons, there is an imperative to try to ensure that available capacity is used to the fullest extent possible. Little or no data typically exist for container train load factors, but a large scale study was conducted in 2007 for trains serving four key British container ports; the load factors for the different ports and rail freight operators are shown in Table 7.2.

Table 7.2: Mean TEU capacity utilisation per train, by port and train operator

	Mean capacity utilisation per train (TEU carried as % of capacity)				
Port	**Freightliner**	**EWS**	**First GBRf**	**Fastline**	**All operators**
Felixstowe	80.6	57.4	90.0	-	80.3
Southampton	67.1	65.8	-	-	57.9
Tilbury	58.0	41.3	-	-	54.7
Thamesport	80.4	-	-	54.0	73.8
Total	**73.4**	**61.7**	**90.0**	**54.0**	**72.2**

Overall, a load factor of 72% was identified. In itself, this means that volumes carried by rail could increase by more than one-third if the existing trains operated were filled to their maximum capacity, with no requirement to operate additional trains. This would have significant benefits over the provision of additional trains to cater for short-term growth, particularly where network infrastructure is congested and enhancements are costly. Of note in terms of good practice, however, is the fact that there is considerable variability around the mean load factor. There may well be inherent reasons why 100% load factors are rarely achievable in practice, but if all other operators were able to match the 90% load factor for First GBRf then rail volumes would increase by one-quarter. The nature of rail freight, with its fixed operating schedules and high capacity services, certainly in comparison to road, makes cooperation and planning vital to maximise the potential that exists.

Good practice: reducing air pollution from road freight transport activity in port areas
(Source: Giuliano & O'Brien (2008))

While much of the focus on sustainability relates to climate change, there are important local air pollution impacts relating to transport activity. In the US, initiatives have been adopted to reduce local air pollution impacts and road congestion around major ports. For example, in 2003 the Californian ports of Los Angeles, Long Beach and Oakland were subjected to a new regulation (AB2650) which sought to improve the throughput of lorries at large port terminals. Terminal operators were subjected to a $250 fine for each vehicle that idled for more than 30 minutes while waiting to enter the terminal. Alternatively, terminal authorities could avoid these penalties by extending their port gate hours to 65 or 70 hours per week (depending on the terminal) to reduce congestion at

the terminal gates, or by implementing a gate appointment system to spread vehicle arrival times. To be more effective, however, the regulations should be extended to cover vehicle idling times within the port area, since this is perceived to be a bigger contributor to local air pollution impacts.

A more successful initiative has been OFFPeak, which was implemented in 2005. The purpose of OFFPeak was to spread the flows of lorries travelling to/from the major ports across a greater part of the 24 hour period. Excepting some exemptions for specific types of movement, a $40 (later $50) Traffic Mitigation Fee was imposed on all vehicles using the port between 08:00 and 17:00 from Monday to Thursday. The impact was greater than expected, with around 22% to 30% of eligible vehicle movements switching to the off-peak period in the first 14 months of operation. This led to a reduction in port-based vehicle movements during the busy daytime periods, with the greater off-peak use of the road networks surrounding the key ports leading to reductions in emissions per vehicle.

One reason for the particular problem at the US ports is the limited operating periods for terminals. In many other UNECE countries the port operating times are far more extensive so there is not the same degree of peaking in vehicles arriving at the terminal. That said, many ports elsewhere do experience road transport congestion around the port area, with consequent air pollution effects. For implementation of a similar system elsewhere in the UNECE, clearly the operating periods of such initiatives designed to tackle local congestion and air pollution could be tailored to suit the port operating times and the periods of congestion on the surrounding road networks.

Good practice: reducing air pollution from waterborne freight transport activity
(Source: EPA (2009))

In March 2009, the US Environmental Protection Authority (EPA) announced radical plans to drastically reduce the emissions of harmful pollutants from ships. The intention is to establish an Emissions Control Area (ECA), effectively a 230 mile buffer zone around the US coastline. It is estimated that as many as 8,300 lives would be saved annually in the US and Canada by 2020. While the proposals have not yet been ratified by the International Maritime Organisation (IMO), it is anticipated that new fuel quality and emission control technologies will apply from 2015/16. When compared to the existing global standards, the expected reductions in pollutants are:

- 98% in the sulphur content of diesel fuel
- 85% of particulate matter emissions
- 80% of nitrogen dioxide emissions

Given the lengthy coastlines in the rest of the UNECE region, it is likely that the introduction of a similar ECA initiative would have considerable air pollution benefits for coastal areas and, consequently, result in the saving of large numbers of lives.

7.5 Cross-border transport initiatives and the development of partnerships

Given the particular problems for international rail freight operations, considerable emphasis has been placed on improving transit times and service quality. Much of the attention has focused on container train services, since they tend to be more time-sensitive than bulk flows, and suffer from greater modal competition.

Good practice example: Bosphorus Europe Express
(Source: Slovenske železnice (2009); Anon (2009b))

AdriaKombi and Kombiverkehr have operated a weekly container train from Ljubljana (Slovenia) to Istanbul (Turkey) since early-2008. This is a complex route, traversing Croatia, Serbia, and Bulgaria en route from Slovenia to Turkey; it therefore includes a mix of EU and non-EU countries, so border crossings are a particular issue. Many of the other issues are similar to those for internal EU flows, however, such as a lack of international interoperability of technical systems, and uncoordinated timetabled paths on either side of country borders. The train has been scheduled to travel the 1,577 km in 60 hours, an average speed of just over 25 km/h; by comparison, the road journey takes 57 hours or more. Due to different electrification systems, some diesel-only track and a lack of interoperability agreements there are eight locomotive changes en route, and border crossings can be lengthy. In 2006, it was estimated that only 2% of freight on this route went by rail.

The corridor has the potential to become a significant east-west route that, in addition to better linking Turkey to the EU market, could see Turkish ports develop as a gateway for freight flows between Asia and Europe. Ljubljana already has good rail freight links to Germany and other EU countries, and the Slovenia to Turkey route is included in Pan-European Corridor 10. For these reasons, efforts are being made to speed up the train and improve its performance. A trial run operated on 16/17 March 2009, with priority over other services, reduced border crossing times and the use of only three locomotives, a 37 hour end-to-end schedule was planned; in reality, the journey was completed in 35 hours, a saving of more than 40% over the normal duration. To enable such time savings on a regular basis will require a streamlining of railway and state border formalities and the general acceptance of interoperable locomotives. In the longer term, it is hoped that the journey time can be reduced to 25 hours, mainly as a result of infrastructure enhancements but also through further improvements in working practices.

Good practice: Rotterdam – Genoa rail freight corridor
(Source: Brugts, (2009))

The Rotterdam to Genoa corridor provides an interesting example of the implementation of the corridor approach that is now favoured by the EU and others. This corridor passes through four countries (see Figure 7.4), serving two seaports, six inland ports and 40 intermodal terminals, and brings together five rail infrastructure managers. The outcomes anticipated from the international corridor focus are a 26% improvement in service reliability, a 52% increase in track capacity, a 20% reduction in journey times and a 10% to 15% decrease in rail infrastructure manager costs. A large component of the initiative, certainly in investment terms, is the construction of new rail infrastructure. However, some of the other measures that have been developed have shown considerable benefits with relatively little financial requirement. As elsewhere, multi-voltage locomotives have been introduced, removing the need for changeovers at borders and speeding up the crossing time. Other 'soft' aspects of interoperability have resulted from a focus on organisational and operational issues, simplifying procedures for customers and developing partnerships between those involved in the national rail networks. High level political support from the four countries' governments has been a critical in achieving results. A new management structure has been implemented, with weekly meetings in Germany of the infrastructure managers to ensure the corridor focus

is maintained. As a consequence of the closer cooperation and better communication, many early low cost improvements have resulted, such as greater international harmonisation of the timetabling process, with standardised intermediate adjustment dates throughout the year leading to more streamlined train paths. In addition, there has been a reduction from an average of 8.7 days in March 2007 to 6.4 days in May 2008 in the response time to make available an ad hoc international train path along the corridor. These improvements demonstrate that much can be done relatively quickly and without significant sums of money being required for large scale infrastructure projects. Political will and greater cooperation can often pay handsome dividends. In the longer-term, the corridor focus should ensure that bottlenecks are identified and dealt with on a coordinated basis and the implementation of new train control systems can be undertaken in a unified manner, further improving the corridor's performance.

Figure 7.4: Rotterdam-Genoa corridor

7.6 Non–transport initiatives to reduce border crossing delays

In Section 6, the often considerable obstacles relating to border crossings were highlighted. This is a general problem, but particularly affects borders where one or both countries are non-EU members. In broad terms, the liberalisation of trade in the EU provides a template by which border crossing delays can be reduced or eliminated, particularly those related to state border formalities. Previous good practice examples in this section have incorporated measures to reduce border delays through, for instance, interoperability agreements for locomotives that can operate with different electrical voltages. While this report focuses primarily on the transport issues, it is important to recognise the impacts of other factors (e.g. customs requirements) on hinterland transport performance.

Good practice: Principles for reducing delays due to border and customs regulations
(Source: WCO (2009); OSCE (2009))

With member countries being responsible for more than 95% of world trade, the WCO is in a strong position to identify and disseminate good practice relating to customs issues at border crossings. As such, the WCO has produced a set of key principles designed to reduce simplify procedures and reduce crossing delays caused by customs requirements. Where these have been applied, customs clearance at border crossings has become faster and, crucially, more predictable and transparent, leading to greater transport efficiency and lower overall business costs. The principles are as follows:

- Transparency and predictability
- Standardisation and simplification of goods declaration and supporting documents
- "Fast track" procedures for authorised persons with good compliance records
- Maximum use of information technology
- Minimum control necessary to ensure compliance
- Adoption of risk management, based on intelligence and targeted checks
- Audit-based controls
- Coordinated intervention where other border agencies are involved
- Partnership with the trade
- Pre-arrival processing, with prior lodgement of documentation

The focus on border crossing best practice is also being addressed by the Organisation for Security and Cooperation in Europe (OSCE), with a particular focus on improving conditions for landlocked countries within the UNECE region. A Handbook of Best Practices at Border Crossings is in development and expected to be published shortly, with practical advice and examples of how to improve the efficiency of cross-border trade while maintaining the necessary levels of customs and security. Many of the examples are expected to come from the landlocked countries in the Central Asian region.

7.7 Data availability

Section 6 highlighted the difficulties involved in developing a thorough understanding of the nature of intermodal hinterland flows due to the traditional focus on individual modes and transport legs in official statistics, and the burdensome nature of more detailed commodity-based surveys. This section highlights two good practice examples where knowledge is enhanced with relatively limited resource requirements.

Case study: Contents of containers passing through Netherlands ports
(Source: Smeets (2008))

A pilot study in the Netherlands has considered ways in which knowledge of container transport chains can be enhanced, together with a better understanding of the commodity types being carried, by combining and analysing a number of existing data sources. Unique container identification numbers are recorded by a number of different data sources: customs data for maritime transport; barge information and communication system for inland waterways; and in data provided by railway companies. In combination, this allows the tracking of individual containers that are being moved intermodally. Additionally, the contents of containers are recorded for

customs requirements, although this is in free text rather than against a pre-defined commodity classification.

The pilot study has shown some promising results, particularly related to the coding of the commodity text where 60% to 75% of containers were coded automatically with a high degree of accuracy. In itself, this provides considerable information for little input, but also allows attention to be focused on sampling the remaining uncoded containers to further improve coverage. For the analysis of transport chains, problems with data quality (e.g. lack of recording the container check digit in almost half of the railway records analysed; double counting of some inland waterway journeys) have so far limited the ability to identify the modal transfers. Given that this was a pilot study, the outcomes have been promising, and it is likely that targeted improvements to data quality would considerably enhance the accuracy of the statistics and allow decision making to be based on a more detailed and accurate understanding of goods flows.

Case study: German method
(Source: Eurostat, 2009a)

The German approach intends to improve understanding of intermodal transport flows on a port-by-port basis without the considerable burden typically associated with commodity flow surveys. Through the combination of existing mode-based transport statistics for shipping, rail, inland waterway and road, supported by expert interviews in ports, more detailed information about mode share and flow origins and destinations can be obtained. This example provides less detailed information than the Dutch one presented previously, but requires even less resource input and may be an appropriate model to follow to obtain standardised information on an international basis while limiting the cost and time required to collect the data.

7.8 Summary

These 'good practice' initiatives demonstrate the importance of a coordinated approach, frequently requiring multimodal and cross-border cooperation to overcome the traditional barriers that result in inefficient hinterland transport activity. Many of the good practice initiatives identified have related to rail transport, since this is where the greatest operational and political barriers tend to exist. A number of the other initiatives have been non-mode specific, focusing on practices that affect hinterland flows by different modes. The next section identifies and develops a number of key issues that result from this identification of good practice examples, and highlights some of the key principles that are often transferable.

8. Discussion: what should the next steps be?

8.1 Introduction

This study has been conducted at a time of considerable uncertainty, both in terms of the global economic situation and with regard to the sustainability agenda relating to climate change and fossil fuel supply. At the holistic level, it would perhaps be appropriate to consider measures that actively reduced the global extent of supply chains and instead focused upon ways in which more local sourcing and consumption patterns could be re-established. This is a much bigger consideration than the scope of this report, and it is not taken forward any further; it would, however, certainly be prudent to consider this in future, particularly if fossil fuel supplies become scarce or prohibitively expensive, or if adopted climate change targets are clearly incompatible with the continued globalisation of supply chains.

This section is structured as follows. First, a set of key principles for decision making is developed based on the analysis that has come before. This is followed by suggested short- and long-term measures to improve the performance of port hinterland flows. The section finishes by highlighting the importance of achieving international solutions to overcome traditional nationalistic tendencies to achieve the highest levels of coordination in policy responses from all parties involved. Throughout the discussion in this section recommendations for the future direction of policies relating to port hinterland connections are discussed. Specific policy recommendations for UNECE are shown in ***bold italics***. In the main, these recommendations are focused on improving the efficiency and sustainability of hinterland movements within to the existing paradigm of international supply chains. The discussion in this section is focused in the main on the European and Central Asian parts of the UNECE region; North America is generally excluded as a result of its geographical separation from the rest of the UNECE countries and the different transport operating environment that pertains in the US and Canada.

8.2 Key principles

Interrelationships with existing policies

It is important to remember that hinterland connections to seaports do not exist in isolation. Goods flows to and from ports share the same transport infrastructure as other transport activity, and are subject to the same policies and regulatory framework that influence the ways in which goods flows materialise across the infrastructure. Therefore, the efficiency and sustainability of hinterland connections is fundamentally affected by the performance of the transport system as a whole. In many respects, it is an artificial distinction to treat hinterlands as a separate issue, although it does help to focus attention on specific features that affect transport chains involving ports.

Evidence-led policy making

A consistent approach towards ports and their hinterland connections across the UNECE region is important, in order to allow competitive markets to function well and on a fair basis and to ensure that decision-making is based upon sound evidence about the likely outcomes. A key issue that has been raised in this report is that the available statistics are generally poorly suited to the analysis of intermodal transport flows. EU countries already account for broadly half of the UNECE membership, and a number of

other UNECE members are EU candidate countries, so a prudent approach would be to encourage the adoption of appropriate Eurostat statistical measures and methodological approaches in non-EU countries. This could be done incrementally, both in terms of specific countries and approaches, as individual countries are able to provide data that conform to the standard methods, so as not to overly burden individual countries with significant data collection requirements. Ideally, though, a realistic target date for compliance with the standard methods should be set so as to encourage action.

Policy recommendation: UNECE to consider its role in a process whereby existing Eurostat statistical measures and methodological approaches can be adopted by non-EU countries

In addition, the report has highlighted the shortcomings of existing mode-based statistics in providing detailed information about intermodal transport chains involving hinterland flows to/from ports. Informed policy making requires a more developed understanding of the nature of transport chains.

Policy recommendation: to seek to ensure that the Working Party on Transport Statistics (WP.6) considers the potential for additional statistics for UNECE member countries that would help to inform policy making for hinterland transport

An agreed set of policy objectives

As has been seen from this report, the private sector has an important role in port hinterland connections. To ensure fairness and consistency, it is necessary to ensure that a consistent set of policy objectives is in place, so that private sector companies can make decisions that may have long-term consequences. An overall framework within which the policy objectives sit should be formulated to relate both to the ways in which the private sector is encouraged to operate in a competitive and efficient manner and the minimisation of the negative impacts of port hinterland flows, not least CO_2 emissions. From the evidence presented in this report, an appropriate set of policy objectives could be based on the following approach, at least in the short-term (see Section 8.4 for discussion of a possible long-term approach), ranging from the strategic down to the operational:

1. measures to promote an efficient and sustainable network of hub and feeder ports for flows by sea to/from the UNECE region
2. the encouragement of the comodality concept to ensure that hinterland transport is organised efficiently and sustainably, with greater emphasis on rail and waterborne modes
3. actions to enhance the efficiency of utilisation and operation of each mode of transport for hinterland flows

Logistics chains are highly complex and ever evolving. The evolution of competitive markets in a liberalised operating environment has brought many benefits, but also considerable negative consequences. Policy objectives should be based on principles of fairness and transparency. In a practical sense, policy makers should set an appropriate framework within which decisions regarding goods flows can be made by actors within logistics chains. The imperfect knowledge of the transport system leads to uncertainty in the outcomes of policy interventions, with the risk of perverse decision making by those involved in supply chains.

Adoption of policies and initiatives appropriate to the situation

It is important to recognise the varying characteristics, and therefore the appropriateness of potential solutions, for different parts of the UNECE region. The provision of suitable transport infrastructure to cater for port hinterland (and other) transport flows is clearly important and, in some cases, new and improved infrastructure will be appropriate (i.e. 'hard' measures). Transport infrastructure capabilities vary considerably across the UNECE region, and constraints particularly apply within the lesser developed countries, and to cross-border routes in general. However, there is not a one-size-fits-all solution, or solution package, so different hinterland problems need to be analysed within the context of the overall objectives but with sufficient flexibility to allow the adoption of the most appropriate measures. In many cases, considerable improvement can be achieved through the application of good practice 'soft' measures (see Section 8.3). In general, the comodality and corridor concepts together form a sound basis on which to evaluate initiatives to improve hinterland connections.

8.3 The short-term: measures to improve efficiency and reduce environmental impacts

Considerable progress towards greater efficiency and sustainability seems possible in the short-term and at little cost through focusing on 'soft' measures. The need for improved intermodal transport statistics was discussed in Section 8.2, to better understand the existing transport chains connected to seaports. In conjunction with this, though, it is evident that a stronger understanding of the factors that affect CO_2 emissions for different types of transport operations is required, in order that appropriate transport options can be encouraged through policy making and chosen by those responsible for making freight transport decisions. At present, sustainability issues are frequently not considered in any great detail when transport routes and modes are evaluated but, where they are, decisions taken in the interests of reducing CO_2 emissions may actually have the opposite effect. While rail and waterborne modes generally do have lower CO_2 emissions than road per unit carried, this is not universally true and it is important to develop a better understanding of the situations when it may be beneficial to use road transport. That said, it is clear that road is currently used for many flows for which it is not best suited, either for efficiency or sustainability.

Many of the good practice examples identified in Section 7 could be more widely adopted in the short-term. There is the potential to generate many quick wins from a range of 'soft' measures that are relatively cheap to implement in comparison to investment in new infrastructure. The Duisburg 'inland port' example showed what can be done by better integration of terminals within the hinterland. Measures to use the transport system more intelligently should also be considered (e.g. to smooth peaks and troughs in demand to make better use of resources), and often this can be achieved through better information systems and partnership working. Greater international coordination is a particularly important issue, and this is considered in more depth in Sections 8.5. There is a clear need, though, to focus specifically on initiatives to improve cross-border coordination and remove barriers to freight flows so as to improve supply chain efficiency and reduce uncertainty over transit times.

Policy recommendation: to encourage good practice adoption for border crossings; this will improve hinterland efficiency in general terms, but most particularly for landlocked non-EU countries

Sustainability is a key factor that needs to be considered when influencing the ways in which transport flows materialise. Within the current orthodoxy, measures that assist in the aggregation of volume along particular corridors provide a stronger chance of efficient transport operations using rail or waterborne modes. Such measures have a tendency to perpetuate the dominance of existing port connections, which may lead to longer distance land-based hinterland legs. If operated efficiently, this may be a relatively sustainable solution, but in the longer-term it may be beneficial to consider an alternative hinterland model, not least because physical limits to port or hinterland throughput may be reached.

8.4 The long-term: challenging the orthodoxy - a new hinterland model?

In the longer-term, there is the potential, and perhaps the need, to encourage or force the development of an 'ideal' port hinterland system which would ensure that decision-making focused on enhancing efficiency and sustainability. On the one hand, an interventionist approach could be adopted, with the public sector significantly influencing the nature of port hinterland flows through direct intervention in port and hinterland infrastructure development, regulations relating to transport modes or distances permissible for certain flows, etc. Alternatively, a framework could be established that encouraged companies to make 'sensible' (i.e. efficient and, crucially, sustainable) supply chain choices relating to ports and hinterland connections. This would require the full development of a robust regulatory and pricing framework that internalised the externalities associated with transport activity, applied on a consistent basis internationally. The second of these approaches is likely to be favourable, since it fits better with the dominant philosophy of market competition and choice, but within a framework that takes full account of the impacts of decisions made regarding routes and transport modes. Increasingly, it is likely that companies will need to focus on a 'carbon budget' in addition to a financial one, so there will be incentives to consider ways of reducing CO_2 emissions resulting from logistics activity. The unsustainable use of fossil fuels also points towards a need for major changes in the way in which transport activity is organised. Particularly where 'hard' measures are proposed, usually at considerable expense, care should be taken to ensure that their lifespan will not be compromised by future events that will fundamentally change the nature of freight flows. For example, in the absence of the widespread adoption of alternative fuel sources for HGVs, the dominance of road freight may be reduced. It seems prudent, therefore, that when major transport infrastructure investment is deemed necessary that due attention is devoted to the long-term sustainability issues.

8.5 The need for a coordinated international approach

There are considerable challenges involved in achieving coordination between many countries and with the involvement of lots of private sector actors. The global scale of the climate change problem means that pan-national agreements need to be promoted so that solutions can be realised; in this respect, the greater the international scale the better. The good practice cross-border and international corridor initiatives identified in Section 7 should help to avoid repeating past mistakes whereby a lack of joined up thinking limited the extent to which initiatives achieved their potential. For example, the Netherlands now has a new rail freight line (the Betuwe line) from the Port of Rotterdam to the German border, which provides significant additional dedicated freight capacity capable of handling more than 10 trains per in each direction. Once over the German border, however, the new line feeds in to the existing German rail network, which has a

considerable number of bottlenecks. By contrast, the specific corridor initiatives under development, such as the Rotterdam to Genoa corridor presented in Section 7, sensibly seek to maximise the performance of strategic corridors and, in time, have the potential to develop in to a strategic network across the UNECE Europe and Central Asia region. Therefore, the new EU policy of focusing on long distance corridors (e.g. through TEN-T and the proposed rail freight network) and considering them in their entirety, with attention focused on bottleneck locations or inefficient procedures, should be more successful at the international level.

As outlined earlier, improved coordination is likely to yield significant improvements in port hinterland connections in the short-term and with little by way of resource requirements through a focus on 'soft' measures that relate to better policy implementation, use of regulations and improved cooperation between actors in what is often a fragmented system. Of course, there will be cases where significant capital is required to provide now or enhanced infrastructure, and more time is needed for development and implementation, dependent on the nature of the problem. It should not be assumed, however, that big infrastructure projects are the most appropriate solutions in all circumstances and, where they are, they should be developed in a coordinated manner to ensure that national boundaries or modal barriers limit the extent to which improvements can be made.

Overall, within the existing structures, the EU has a significant role to play and should be encouraged to focus on the strategic transport network through its TEN-T programme. Many internal cross-border EU projects seem to be gaining momentum, but progress on developing the axes to neighbouring countries (including EU candidate countries) has been slower and the future direction lacks clarity, particularly at a time when budgetary constraints may be more significant as a result of the global economic downturn. As such, it is important that a structured and rigorous approach, using Transport Infrastructure Needs Assessment (TINA) studies, is adopted to prioritise investment in transport corridors; given the disparity in transport infrastructure quality, this is likely to favour the development of infrastructure links between the EU and neighbouring countries to the east.

Sections 6 and 7 discussed the considerable obstacles associated with many border crossings and identified examples of good practice where such obstacles have been mitigated or removed through the implementation of different initiatives. Clearly there is great potential for such good practice to be disseminated far more widely, and this should be encouraged.

Policy recommendation: to encourage the EU to maintain a clear focus on improving transport infrastructure and operations with neighbouring UNECE countries, particularly EU candidate countries

From a longer-term perspective, it does not seem sensible for international agencies to routinely become involved in detailed proposals for port hinterland infrastructure development or specific initiatives related to particular locations or corridors. Instead, attention should be focused on the development of a set of principles relating to both the 'hard' and 'soft' measures, to ensure that decision making is coordinated and consistent. For example, the internalisation of external transport costs (such as those related to CO2 emissions) should be pursued as a priority to allow the comodality concept to develop in a true sense.

In the light of this analysis, there appears to be considerable scope for an international agency to lead the way in encouraging further international cooperation and in raising awareness about good practices that could be adopted more widely. This agency would also be in a strong position to bring together the wide range of national and modal organisations that are often working with less coordination than is ideal. At present, it is unclear whether an appropriate existing agency is equipped to take on this role, since many have specific modal-, spatial- or topic-based remits. The UNECE itself may provide an appropriate forum but, if not, then there may be a requirement to establish a new agency. Given that port hinterlands are ever changing and overlapping it is probably appropriate that the agency has with a more general focus on strategic international corridors which connect ports and other major areas of transport activity, rather than a specific port hinterland remit.

Policy recommendation: in conjunction with others, UNECE to consider what would be the most appropriate form of international agency to promote strategic hinterland transport connections, and to determine the most appropriate forum in which to continue the development of policies for hinterland connections to seaports

8.6 Summary of policy recommendations

This section has proposed a range of policies to enhance the efficiency and sustainability of port hinterland connections. The specific recommendations for UNECE to consider are:

- UNECE to consider its role in a process whereby existing Eurostat statistical measures and methodological approaches can be adopted by non-EU countries
- to seek to ensure that the Working Party on Transport Statistics (WP.6) considers the potential for additional statistics for UNECE member countries that would help to inform policy making for hinterland transport
- to encourage good practice adoption for border crossings; this will improve hinterland efficiency in general terms, but most particularly for landlocked non-EU countries
- to encourage the EU to maintain a clear focus on improving transport infrastructure and operations with neighbouring UNECE countries, particularly EU candidate countries
- in conjunction with others, UNECE to consider what would be the most appropriate form of international agency to promote strategic hinterland transport connections, and to determine the most appropriate forum in which to continue the development of policies for hinterland connections to seaports

9. Conclusions

This report had five objectives, which have been dealt with in the manner set out in Section 1. The objectives were:

- To determine the key issues in the existing literature relating to the performance of seaports and their hinterland connections
- To assess the key trends in the container and ferry markets in the UNECE region, including port hinterland flows
- To identify good practice in achieving efficient and sustainable hinterland goods movements
- To consider ways in which the specific problems faced by landlocked emerging economies can be overcome
- To recommend ways in which the connectivity of seaports and their hinterlands can be improved

From both the review of academic literature and the overview of the contemporary policy framework it is clear that port hinterland connections are becoming significant concerns within supply chains and for policy makers. The huge growth in container (and ferry) trade through key UNECE ports has put considerable pressure on landward connections. Given that hinterland areas are rarely captive now, but are instead contestable with two or more ports competing to serve the inland areas, port authorities are becoming increasingly interested in hinterland transport performance. Logistics chain decision makers are now more concerned about the attributes of entire chains rather than specific legs, and ports with poor connections risk losing business to competitors who can offer better performing transport links. Evidence is mounting that hinterland connections are frequently the weakest link of the logistics chain. Public policy makers, while concerned about the economic impacts of inefficient transport operations, are now contending with the growing sustainability agenda and the challenges that this poses for international supply chains. The traditional focus in the EU on the development of the Single European Market, with similar liberalisation processes also taking place in certain other UNECE countries, is now joined by concerns over climate change. There is now a stronger focus on cost internalisation and the appropriate use of the range of transport modes. The balancing of economic development and sustainability objectives is one that remains unresolved, given the many conflicts that still exist. The likelihood of increasingly stringent national and international targets for greenhouse gas emissions, and the associated development of carbon budgets and caps, seems likely to fundamentally influence decision-making, the aim being to improve supply chain efficiency and sustainability.

In the analysis of container and ferry flows, there are considerable data constraints that hinder the detailed understanding of trends in volumes and, particularly, the nature of the hinterland transport activity that results. Where good quality data exist, they are often inconsistent spatially and/or over time. Despite this, the study has identified a number of issues that are important in the understanding of port hinterland performance, and has discussed the effects of the currently imperfect knowledge of the situation. Further, the sustained growth in activity over recent decades seems to have halted since 2008 as a result of the global economic downturn. It is too early to judge the likely extent of the downturn or the effects that it will have on port throughput in the UNECE region, but

there may be opportunities to improve efficiency and sustainability in the responses that will be taken to the economic circumstances.

From Section 6 onwards, the report considered in depth a number of key issues affecting the performance of port hinterland transport connections and then identified a range of good practices related to different aspects of hinterland performance that exist across the UNECE region. In many cases, imperfect knowledge and the lack of consistent, good quality data hinder the detailed understanding of the effects of different factors on the performance of hinterland transport. The importance of a more balanced and integrated approach to the transport modes was discussed, particularly in the context of developing solutions that are more sustainable as well as more efficient. It is vital that recent efforts to improve supply chain sustainability are not sacrificed as a consequence of the global economic downturn. The current economic situation provides a platform for a new approach to dealing with hinterland connections that both encourages greater operational efficiency and leads to lower environmental impacts.

One of the key themes of the 'good practice' initiatives identified in Section 7 is the importance of a coordinated approach, frequently requiring multimodal and cross-border cooperation to overcome the traditional barriers that result in inefficient hinterland transport activity. Many of the good practice initiatives related to rail transport, since this is where the greatest operational and political barriers tend to exist. A number of the other initiatives have been non-mode specific, focusing on practices that affect hinterland flows by different modes. Land-locked economies in particular stand to benefit from the greater adoption of good practice initiatives that improve hinterland efficiency.

It is evident from the analysis in this report that common objectives across the UNECE region do not always currently exist in relation to ports and their hinterland connections. That said, there have been significant improvements at the international level in recent years and, in particular the single market and its associated policies are starting to make a considerable difference internally to the EU. Elsewhere, the growth in international trade has led to a greater focus on cross-border problems and solutions. It is clear that there are many examples of good practice occurring across the UNECE region, but that many solutions are developing on an ad hoc basis. In light of this analysis, there appears to be considerable scope for an international agency to lead the way in encouraging further international cooperation and in raising awareness about good practices that could be adopted more widely. This agency would also be in a strong position to bring together the wide range of national and modal organisations that are often working with less coordination than is ideal. At present, it is unclear whether an appropriate existing agency is equipped to take on this role. If not then there may be a requirement to establish one, though perhaps with a focus on strategic international corridors rather than a specific port hinterland remit, with sustainability issues to the fore.

Significant improvements in the efficiency and sustainability of port hinterland connections are likely to be achievable in the short-term, and with little by way of resource requirements, through a focus on 'soft' measures that relate to better policy implementation, use of regulations and improved cooperation between actors in what is often a fragmented system. Of course, there will be cases where significant capital is required, and more time is needed for development and implementation, dependent on the nature of the problem. It should not be assumed, however, that big infrastructure projects are always the most appropriate solutions.

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Appendix 1: Copy of UNECE questionnaire

To be added to final version

Appendix 2: Statistical information

Table I: Analysis of responses to questions B7 and B8

B7: Overall, how well does each of the transport modes currently perform in satisfying the requirements of container flows through the port? (1 – very inefficient, 10 – very efficient)

Full sample (n = 33)	Road	Rail	IWW	Short sea	Coastal
Average	7.9	6.7	5.5	7.2	6.8
St. dev.	1.83	2.62	2.73	2.82	2.90
No. of observations	30	23	8	11	12
Turkey (n = 13)					
Average	8.8	6.9	1.0	5.3	7.3
St. dev.	1.34	3.67	-	4.04	3.77
No. of observations	13	7	1	3	4
EU-15 (n = 10)					
Average	7.1	7.4	6.6	7.5	6.5
St. dev.	2.20	1.85	1.34	2.43	2.62
No. of observations	9	8	5	6	8
New EU countries + Russian Federation + Ukraine (n = 8)					
Average	6.8	5.3	-	9.0	-
St. dev.	1.47	2.16	-	0.00	-
No. of observations	6	6	-	2	-

B8: How do you think the performance of each of the transport modes will change in the next 10 years for container flows through the port? (1 – become much worse, 10 – become much better)

Full sample (n = 33)	Road	Rail	IWW	Short sea	Coastal
Average	8.0	8.0	7.1	8.1	7.5
St. dev.	2.07	1.67	2.73	1.69	1.92
No. of observations	29	26	10	14	15
Turkey (n = 13)					
Average	9.3	7.8	6.0	7.6	7.8
St. dev.	1.60	2.15	2.83	2.30	2.71
No. of observations	12	10	2	5	6
EU-15 (n = 10)					
Average	6.3	8.2	7.8	8.0	7.3
St. dev.	2.00	1.09	2.56	1.29	1.32
No. of observations	10	9	6	7	9
New EU countries + Russian Federation + Ukraine (n = 8)					
Average	8.5	7.7	3.0	9.5	-
St. dev.	1.05	1.63	-	0.71	-
No. of observations	6	6	1	2	-

Table II: UNCTAD Liner Shipping Connectivity Index

	2004		2005		2006		2007		2008		% change
	LSCI	Rank	LSCI	Rank	LSCI	Rank	LSCI	Rank	LSCI	Rank	2004-2008
Germany	76.6	*7*	78.4	*7*	80.7	*7*	89.0	*3*	89.3	*4*	16.5
Netherlands	78.8	*6*	80.0	*5*	81.0	*6*	84.8	*5*	87.6	*5*	11.1
United States	83.3	*3*	87.6	*3*	85.8	*4*	83.7	*6*	82.5	*6*	-1.0
United Kingdom	81.7	*5*	79.6	*6*	81.5	*5*	76.8	*9*	78.0	*7*	-4.5
Belgium	73.2	*8*	74.2	*8*	76.2	*8*	73.9	*10*	78.0	*8*	6.6
Spain	54.4	*15*	58.2	*15*	62.3	*14*	71.3	*11*	67.7	*11*	24.3
France	67.3	*11*		*10*	67.8	*11*	64.8	*12*	66.2	*13*	-1.6
Italy	58.1	*14*	62.2	*14*	58.1	*15*	58.8	*15*	55.9	*15*	-3.9
Turkey	25.6	*29*	27.1	*28*	27.1	*29*	32.6	*23*	35.6	*23*	39.2
Portugal	17.5	*41*	16.8	*43*	23.6	*36*	25.4	*38*	35.0	*24*	99.4
Canada	39.7	*17*	39.8	*17*	36.3	*21*	34.4	*22*	34.3	*25*	-13.6
Sweden	14.8	*48*	26.6	*29*	28.2	*27*	25.8	*35*	30.3	*30*	105.1
Malta	27.5	*25*	25.7	*31*	30.3	*25*	29.5	*29*	29.9	*32*	8.7
Greece	30.2	*24*	29.1	*25*	31.3	*24*	30.7	*26*	27.1	*36*	-10.2
Denmark	11.6	*64*	24.3	*34*	25.4	*35*	22.1	*42*	26.5	*37*	129.2
Romania	12.0	*61*	15.4	*48*	17.6	*45*	22.5	*41*	26.4	*38*	119.2
Ukraine	11.2	*65*	10.8	*68*	14.9	*56*	16.7	*55*	23.6	*42*	111.3
Israel	20.4	*35*	20.1	*39*	20.4	*41*	21.4	*43*	19.8	*49*	-2.7
Slovenia	13.9	*51*	13.9	*55*	11.0	*70*	12.9	*69*	15.7	*61*	12.6
Croatia	8.6	*85*	12.2	*64*	10.5	*72*	12.3	*70*	15.4	*64*	79.1
Russian Fed.	11.9	*6.2*	12.7	*60*	12.8	*63*	14.1	*66*	15.3	*65*	28.7
Cyprus	14.4	*49*	18.5	*42*	17.4	*46*	18.0	*49*	11.8	*73*	-17.9
Finland	9.5	*77*	10.2	*77*	8.6	*84*	10.7	*74*	9.7	*82*	2.9
Poland	7.3	*92*	7.5	*92*	7.5	*94*	7.9	*94*	9.3	*83*	28.1
Norway	9.2	*79*	8.3	*88*	7.3	*96*	7.8	*96*	7.9	*94*	-14.4
Lithuania	5.2	*115*	5.9	*108*	5.7	*105*	6.8	*101*	7.8	*96*	48.7
Ireland	8.8	*82*	9.7	*80*	8.2	*89*	8.9	*82*	7.6	*98*	-13.0
Latvia	6.4	*100*	5.8	*110*	5.1	*112*	5.9	*111*	5.5	*109*	-13.4
Estonia	7.1	*93*	6.5	*100*	5.8	*103*	5.8	*113*	5.5	*110*	-22.3
Bulgaria	6.2	*103*	5.6	*112*	4.5	*122*	4.8	*120*	5.1	*118*	-17.5
Montenegro	2.9	*143*	2.9	*143*	3.0	*142*	3.0	*148*	3.2	*149*	9.6
Czech Republic	0.4	*161*	0.4	*161*	0.4	*161*	0.4	*161*	3.2	*150*	627.0
Switzerland	3.5	*135*	3.4	*138*	3.2	*140*	3.3	*139*	3.0	*153*	-14.6
Albania	0.4	*162*	0.4	*162*	0.4	*162*	2.3	*156*	2.0	*158*	396.1

Table III: Scores and rankings of UNECE countries on the International LPI

Global rank	Country	LPI	Customs	Infrastructure	International shipments	Logistics competence	Tracking & tracing	Domestic logistics costs	Timeliness
2	Netherlands	4.18	3.99	4.29	4.05	4.25	4.14	2.65	4.38
3	Germany	4.10	3.88	4.19	3.91	4.21	4.12	2.34	4.33
4	Sweden	4.08	3.85	4.11	3.90	4.06	4.15	2.44	4.43
5	*Austria*	*4.06*	*3.83*	*4.06*	*3.97*	*4.13*	*3.97*	*2.24*	*4.44*
7	*Switzerland*	*4.02*	*3.85*	*4.13*	*3.67*	*4.00*	*4.04*	*2.26*	*4.48*
9	United Kingdom	3.99	3.74	4.05	3.85	4.02	4.10	2.21	4.25
10	Canada	3.92	3.82	3.95	3.78	3.85	3.98	2.84	4.19
11	Ireland	3.91	3.82	3.72	3.76	3.93	3.96	2.65	4.32
12	Belgium	3.89	3.61	4.00	3.65	3.95	3.96	2.62	4.25
13	Denmark	3.86	3.97	3.82	3.67	3.83	3.76	2.52	4.11
14	United States	3.84	3.52	4.07	3.58	3.85	4.01	2.20	4.11
15	Finland	3.82	3.68	3.81	3.30	3.85	4.17	2.22	4.18
16	Norway	3.81	3.76	3.82	3.62	3.78	3.67	2.08	4.24
18	France	3.76	3.51	3.82	3.63	3.76	3.87	2.34	4.02
22	Italy	3.58	3.19	3.52	3.57	3.63	3.66	2.39	3.93
23	*Luxembourg*	*3.54*	*3.67*	*3.86*	*3.00*	*3.22*	*3.56*	*2.88*	*4.00*
26	Spain	3.52	3.17	3.51	3.45	3.55	3.63	2.75	3.86
28	Portugal	3.38	3.24	3.16	3.23	3.19	3.44	2.78	4.06
29	Greece	3.36	3.06	3.05	3.11	3.33	3.53	2.87	4.13
33	Israel	3.21	2.73	3.00	3.27	3.23	3.46	2.17	3.58
34	Turkey	3.15	3.00	2.94	3.07	3.29	3.27	2.71	3.38
35	*Hungary*	*3.15*	*3.00*	*3.12*	*3.07*	*3.07*	*3.00*	*3.00*	*3.69*
37	Slovenia	3.14	2.79	3.22	3.14	3.09	2.91	3.18	3.73
38	*Czech Republic*	*3.13*	*2.95*	*3.00*	*3.06*	*3.00*	*3.27*	*3.40*	*3.56*
40	Poland	3.04	2.88	2.69	2.92	3.04	3.12	3.23	3.59
42	Latvia	3.02	2.53	2.56	3.31	2.94	3.06	2.94	3.69
47	Estonia	2.95	2.75	2.91	2.85	3.00	2.84	3.29	3.35
49	Cyprus	2.92	2.77	2.91	2.92	2.77	2.92	2.92	3.25
50	*Slovakia*	*2.92*	*2.61*	*2.68*	*3.09*	*3.00*	*2.87*	*3.09*	*3.26*
51	Romania	2.91	2.60	2.73	3.20	2.86	2.86	2.62	3.18
55	Bulgaria	2.87	2.47	2.47	2.79	2.86	3.14	2.91	3.56
58	Lithuania	2.78	2.64	2.30	3.00	2.70	2.60	3.00	3.40
63	Croatia	2.71	2.36	2.50	2.69	2.83	2.46	3.08	3.45
73	Ukraine	2.55	2.22	2.35	2.53	2.41	2.53	3.25	3.31
74	*Belarus*	*2.53*	*2.67*	*2.63*	*2.13*	*2.13*	*2.71*	*3.13*	*3.00*
88	Bosnia & Herzegovina	2.46	2.32	2.26	2.50	2.37	2.29	3.41	3.00
90	*Macedonia, FYR*	*2.43*	*2.00*	*2.29*	*2.67*	*2.33*	*2.50*	*3.00*	*2.83*
99	Russian Federation	2.37	1.94	2.23	2.48	2.46	2.17	2.40	2.94
103	*Kyrgyzstan*	*2.35*	*2.20*	*2.06*	*2.35*	*2.35*	*2.38*	*2.80*	*2.76*
106	*Moldova*	*2.31*	*2.14*	*1.94*	*2.36*	*2.21*	*2.50*	*2.92*	*2.73*
111	*Azerbaijan*	*2.29*	*2.23*	*2.00*	*2.50*	*2.00*	*2.38*	*2.88*	*2.63*
115	Serbia & Montenegro *	2.28	2.33	2.18	2.25	2.29	2.07	3.07	2.54
129	*Uzbekistan*	*2.16*	*1.94*	*2.00*	*2.07*	*2.15*	*2.08*	*2.91*	*2.73*
131	*Armenia*	*2.14*	*2.10*	*1.78*	*2.00*	*2.11*	*2.22*	*3.43*	*2.63*
133	*Kazakhstan*	*2.13*	*1.91*	*1.86*	*2.10*	*2.05*	*2.19*	*2.81*	*2.65*
139	Albania	2.08	2.00	2.33	2.33	2.00	1.67	2.78	2.13
146	*Tajikistan*	*1.93*	*1.91*	*2.00*	*2.00*	*1.90*	*1.67*	*2.33*	*2.11*

Source: extracted from World Bank (2007a); 1 is the lowest score and 5 is the maximum score; countries shown in red italics are landlocked; * - Serbia & Montenegro have subsequently separated, with Serbia being landlocked

Table IV: Comparison of time, cost and number of documents for export from UNECE countries (ranked by export cost)

Country	Documents for export (number)	Time for export (days)	Cost to export (US$ per container)	Documents for import (number)	Time for import (days)	Cost to import (US$ per container)
Finland	4	8	495	5	8	575
Israel	5	12	665	4	12	605
Denmark	4	5	681	3	5	681
Portugal	6	16	685	7	16	999
Sweden	4	8	697	3	6	735
Estonia	3	5	730	4	5	740
Albania	7	21	770	9	22	775
Norway	4	7	780	4	7	709
Germany	4	7	822	5	7	887
Poland	5	17	884	5	27	884
Lithuania	6	10	870	6	13	980
Netherlands	4	6	895	5	6	1,020
Latvia	6	13	900	6	12	850
Turkey	7	14	940	8	15	1,063
Czech Republic	*4*	*17*	*985*	*7*	*20*	*1,087*
United States	4	6	990	5	5	1,245
United Kingdom	4	13	1,030	4	13	1,350
Bosnia & Herzegovina	6	16	1,070	7	16	1,035
Slovenia	6	20	1,075	8	21	1,130
France	2	9	1,078	2	11	1,248
Iceland	5	15	1,109	5	14	1,183
Ireland	4	7	1,109	4	12	1,121
Spain	6	9	1,121	8	10	1,121
Austria	*4*	*7*	*1,125*	*5*	*8*	*1,125*
Greece	5	20	1,153	6	25	1,265
Ukraine	6	31	1,230	10	36	1,250
Romania	5	12	1,275	6	13	1,175
Croatia	7	20	1,281	8	16	1,141
Hungary	*5*	*18*	*1,300*	*7*	*17*	*1,290*
Italy	5	20	1,305	5	18	1,305
Macedonia, FYR	*6*	*17*	*1,315*	*6*	*15*	*1,325*
Georgia	8	12	1,380	7	14	1,340
Serbia	*6*	*12*	*1,398*	*6*	*14*	*1,559*
Luxembourg	*5*	*6*	*1,420*	*4*	*6*	*1,420*
Slovakia	*6*	*25*	*1,445*	*8*	*25*	*1,445*
Switzerland	*4*	*8*	*1,537*	*5*	*9*	*1,505*
Belgium	4	8	1,619	5	9	1,600
Bulgaria	5	23	1,626	7	21	1,776
Canada	3	7	1,660	4	11	1,785
Montenegro	9	18	1,710	7	19	1,910
Armenia	*7*	*30*	*1,746*	*9*	*24*	*1,981*
Belarus	*8*	*20*	*1,772*	*8*	*26*	*1,720*
Moldova	*6*	*32*	*1,775*	*7*	*35*	*1,895*
Russian Federation	8	36	2,150	13	36	2,150
Kyrgyzstan	*13*	*64*	*3,000*	*13*	*75*	*3,250*
Kazakhstan	*11*	*89*	*3,005*	*13*	*76*	*3,055*
Azerbaijan	*9*	*48*	*3,075*	*14*	*56*	*3,420*
Uzbekistan	*7*	*80*	*3,100*	*11*	*104*	*4,600*
Tajikistan	*10*	*82*	*3,150*	*10*	*83*	*4,550*

Source: based on World Bank (2008b); countries shown in red italics are landlocked

Table V: The Enabling Trade Index 2008 (ranked by overall score)

	Sub-Indexes									
	Overall Index		Market access		Border administration		Transport & communi-cations infrastructure		Business environment	
Country	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**
Sweden	3	5.66	14	5.21	2	6.32	1	5.77	14	5.35
Norway	4	5.65	2	5.89	6	6.06	20	5.21	10	5.45
Canada	5	5.62	3	5.87	9	5.78	11	5.50	16	5.33
Denmark	6	5.62	15	5.15	5	6.10	10	5.51	5	5.70
Finland	7	5.61	19	5.08	4	6.15	18	5.29	1	5.92
Germany	8	5.58	9	5.34	15	5.57	5	5.66	4	5.74
Switzerland	*9*	*5.58*	*5*	*5.65*	*12*	*5.69*	*14*	*5.39*	*7*	*5.58*
Netherlands	11	5.51	18	5.10	8	5.98	2	5.73	17	5.22
Luxembourg	*12*	*5.50*	*17*	*5.10*	*10*	*5.77*	*9*	*5.51*	*6*	*5.63*
United States	14	5.42	6	5.65	21	5.29	3	5.66	25	5.08
Austria	*15*	*5.42*	*13*	*5.22*	*16*	*5.57*	*12*	*5.43*	*9*	*5.45*
United Kingdom	16	5.30	24	5.02	14	5.58	8	5.52	26	5.07
Belgium	18	5.21	16	5.12	25	5.23	16	5.33	20	5.16
France	19	5.20	20	5.08	26	5.21	6	5.54	31	4.98
Ireland	20	5.20	25	5.01	19	5.43	24	4.79	8	5.56
Spain	22	5.03	34	4.87	23	5.26	22	5.08	33	4.92
Estonia	25	4.89	47	4.66	13	5.63	29	4.51	39	4.76
Portugal	26	4.88	45	4.72	32	4.85	28	4.57	13	5.39
Israel	28	4.76	36	4.84	29	5.03	26	4.64	57	4.53
Slovakia	*30*	*4.74*	*23*	*5.03*	*35*	*4.68*	*35*	*4.17*	*24*	*5.09*
Slovenia	31	4.74	21	5.07	30	4.91	30	4.49	63	4.48
Czech Republic	*32*	*4.70*	*33*	*4.94*	*31*	*4.86*	*34*	*4.18*	*38*	*4.84*
Italy	33	4.70	30	4.97	38	4.58	25	4.68	54	4.57
Hungary	*34*	*4.67*	*41*	*4.76*	*33*	*4.79*	*38*	*4.10*	*28*	*5.05*
Lithuania	35	4.63	32	4.95	28	5.04	37	4.14	67	4.40
Greece	36	4.60	31	4.95	54	4.08	31	4.49	36	4.86
Turkey	38	4.53	8	5.40	47	4.28	44	3.79	50	4.64
Cyprus	39	4.50	49	4.51	44	4.37	32	4.41	41	4.72
Croatia	42	4.45	12	5.24	52	4.15	43	3.89	56	4.54
Latvia	43	4.45	48	4.55	40	4.54	39	4.08	51	4.61
Poland	45	4.35	42	4.73	37	4.62	46	3.70	73	4.35
Romania	57	4.04	61	4.25	61	4.02	49	3.64	81	4.24
Bulgaria	60	3.90	56	4.31	57	4.07	54	3.52	107	3.71
Armenia	*61*	*3.90*	*43*	*4.73*	*87*	*3.28*	*77*	*3.00*	*53*	*4.59*
Moldova	*62*	*3.88*	*26*	*4.99*	*75*	*3.65*	*76*	*3.05*	*101*	*3.83*
Ukraine	68	3.77	39	4.77	94	3.17	59	3.42	106	3.73
Kazakhstan	*72*	*3.73*	*37*	*4.83*	*110*	*2.70*	*63*	*3.31*	*88*	*4.06*
Albania	73	3.72	57	4.29	64	3.89	106	2.47	82	4.22
Azerbaijan	*76*	*3.68*	*65*	*4.15*	*112*	*2.62*	*64*	*3.30*	*46*	*4.66*
Macedonia, FYR	*81*	*3.58*	*86*	*3.64*	*80*	*3.58*	*69*	*3.19*	*97*	*3.90*
Bosnia & Herzegovina	89	3.47	97	3.29	72	3.68	86	2.91	90	3.98
Russian Federation	103	3.25	99	3.11	92	3.20	60	3.35	114	3.35
Tajikistan	*104*	*3.13*	*83*	*3.74*	*117*	*2.40*	*117*	*2.02*	*69*	*4.38*
Uzbekistan	*105*	*3.06*	*114*	*2.46*	*116*	*2.43*	*84*	*2.94*	*65*	*4.43*
Kyrgyzstan	*109*	*3.03*	*102*	*2.95*	*104*	*2.84*	*88*	*2.88*	*113*	*3.44*

Source: based on World Economic Forum (2008); countries shown in red italics are landlocked