# *DIFFERENT*

## User Reaction and Efficient Differentiation of Charges and Tolls

DELIVERABLE D6.2

# RECOMMENDATIONS FOR DIFFERENTIATED CHARGES IN SHIPPING

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## ABBREVIATIONS

| | |
|---|---|
| ASEK | abbreviation (in Swedish) for Working Group for Cost Benefit Calculations |
| ECSA | European Community Shipowners' Association |
| ETS | Emissions Trading Scheme |
| EU | European Union |
| FEU | Forty-Foot Equivalent Unit |
| GRT | Gross Registered Tonne |
| GT | Gross Tonnage |
| HAM | Humid Air Motor |
| HHLA | Hamburger Hafen und Logistik AG |
| HPA | Hamburg Port Authority |
| IMO | International Maritime Organisation |
| ISL | Institute for Shipping and Logistics |
| kWh | Kilowatt Hour |
| LTMP | Long Term Marginal Pricing |
| NO | Nitrogen Oxide |
| NT | Net Tonnage |
| SCR | Selective Catalytic Reduction |
| SEK | Swedish Krona |
| SMA | Swedish Maritime Administration |
| SMCP | Social Marginal Cost Pricing |
| $SO_2$ | Sulphur Dioxide |
| SSA | Swedish Shipowners' Association |
| SSS | Short Sea Shipping |
| TEU | Twenty Foot Equivalent Unit |
| TRi | Transport Research Institute |
| UK | United Kingdom |
| UNCTAD | United Nations Conference for Trade and Development |

## EXECUTIVE SUMMARY

In the European Union (EU) levels and structures of port infrastructure charges vary strongly across countries and terminals. The existing charging regimes seem to be far from internalising external costs and are rarely based on efficiency principles. Differentiation of charges might be an intermediate step towards the envisaged application of marginal social cost pricing in the European Union. The deliverable presents recommendations derived from the research during the course of the DIFFERENT project.

The deliverable summarises the existing structure of differentiation in infrastructure charges and delivers recommendations towards the further development of differentiation schemes and strategies. The deliverable seeks to present recommendations that take into account the user perspective of the existing charges and their potential reaction to further differentiation of these charges.

In a market driven environment with increasing competition, differentiation of services is a principal means of port strategy. Differentiation of prices is a way to express and present the port's strategy as shown by the example of the Port of Gothenburg and the Port of Valencia.

Shipping is a globalised industry and is currently functioning and competitive. In recent years it has been aimed at reducing the public sector involvement in ports and a main direction has been the implementation of private sector principles in ports and, especially, port authorities. This devolution process has increased the determination of port authorities to make profits and to be efficient. In this devolution process different solutions and systems have been implemented which are adjusted to the institutional structures and environment of each port. The differences also reflect the wide range of shipping markets.

Differentiation of port infrastructure charges has to be seen in relation to market developments. Any differentiation scheme needs to include an evolutionary set up, which allows the effective implementation of adjustments in order to maintain the efficiency of the differentiation scheme.

The deliverable presents forward thinking ideas how differentiation of port infrastructure charges might be addressed in a wider policy context.

# 1 INTRODUCTION

## 1.1 BACKGROUND

Differentiation of infrastructure charges in shipping has gained new interest from policy makers. Differentiation of port infrastructures charges has evolved historically and in the past has been driven by market forces and strategic considerations of port actors. Recently, new topics in differentiation have turned up related to global and EU wide market and industry developments. In the European context the strengthening of Short Sea Shipping (SSS), environmental and quality shipping aspects can be identified as the main topics.

In general, ports are no different from any other multi-product industry offering a range of services and operating under different environments and organisational structures. However, the port sector is neither standardised nor homogenous in regard to ownership, organisation, competitive framework and administration. Furthermore, ports vary in size, functions and geographical reach of hinterlands. Therefore pricing strategies vary as well, whereas the basic scaling factors used for price differentiation are somehow similar. In this respect the operational scheme of a port, whether it is operated by a public body, concessioned (i.e. landlord scheme) or fully private operation, has a significant impact on the charges levied by the different bodies. This also means that ports are subject to different degrees of regulation and supervision.

A key determinant of all ship travel is, at least insofar as the operator is concerned, that it is business oriented, with operators searching for the most efficient way to do things as a response to company efficiency and user demands. The shipping market can be split in general cargo, container, and dry and liquid bulk markets each using different ship types.

A key distinction has to be made for ferries. This transport vehicle is capable of carrying passengers, accompanied cars and freight vehicles (accompanied or unaccompanied) at the same time. This makes the ferry rather unique amongst transport modes because of its combined large freight and passenger carrying capability. In the case of road and rail, freight and passenger transport demand tends to conflict, whereas on a ferry they function in a complementary way.

Many ports provide services to a number of these markets and thus the ship type used in each market is the most evident differentiation criteria, since the transported products also have different price elasticities, depending on the overall value of the product.

The reaction of shipping operators to user charges is perhaps easier to predict compared to car drivers; the latter will tend to react with a mix of rational and irrational behaviour, whereas shipping operators will typically react by searching for cheaper or most efficient ways of doing things.

In many cases the structure of port charges is clearly defined for the public domain, but port charges are actually a matter of negotiation, especially for large customers. This poses a significant challenge in analysing the effectiveness of differentiation in the shipping sector and implies the question in how far the existing differentiation schemes are brought forward in real market application. In this context the author assumes that the concept of differentiation is in some respect applied and reflected in the actual contracts. But one should be aware that the effectiveness of differentiation might be questioned in this context.

In the general context of published charging schemes, the following dimensions of differentiation prevail:

- Ship type
- Type of traffic
- Frequency
- Location
- Compliance with standards (e.g. environmental standards).

The dimensions of differentiation of charges have evolved from market requirements and can be attributed to strategic reasons. The devolution of ports (terminal and port authorities) from public to principles of private sector operation or private operation as well as the competition over traffic and hinterlands has driven towards more differentiated and strategic charging schemes. These reflect:

- Maximisation of revenue - the willingness to pay of specific user groups mainly related to cargo types
- Risk mitigation (certain ship types pose greater environmental risks e.g. tankers)
- Market expansion (e.g. Short Sea Shipping)
- Political reasons
- Differentiation of the port service product in competitive environments.

The implementation of some of these measures implies costs for the institution or body in charge, especially for differentiation deriving from political reasoning in an environment evolving towards working under private sector principles, and this creates certain challenges, which will be detailed in the following.

## 1.2 SCOPE

The deliverable addresses existing systems of differentiation within the shipping sector, reflecting on the findings from the deliverables from Workpackage 3 and the analytical Deliverable 6.1. The presented recommendations reflect the current state of scientific research, findings from the cases studies and literature review and are set into relation with findings in parallel research projects (i.e. GRACE, IMPRINT).

The focus of the recommendations is on the actual charges applying to a ship and hence the ship operator as the recipient of differentiated charges in port. A key distinction between certain ship types has to be made. Ferries present are particular case since this transport vehicle is capable of carrying passengers, accompanied cars and freight vehicles (accompanied or unaccompanied). The recommendations are split differentiated for cargo shipping and passenger shipping.

The document is structured as follows. Section two gives a selective overview on differentiation schemes in the ports analysed in the case studies in Deliverable 6.1. Section three discusses the role of port infrastructure charges in the context of overall port charges and transport costs. The following section four describes the dynamics and main findings in relations to efficiency of and user reaction to differentiation of port infrastructure charges. Section 5 reflects on the responsiveness of the global shipping industry to differentiation and the final section presents a summary of recommendations.

# 2 DIFFERENTIATION IN PORTS - A SELECTIVE OVERVIEW

## 2.1 HAMBURG

The port of Hamburg is one of the principal gateways in Northern Europe. In relation to infrastructure charges the port of Hamburg has the typical structure of modern ports, which does consist of the port authority (Hamburg Port Authority – HPA) and a number of private operators in the port's terminals, responsible for related services.

The transparent regulation of port prices and investment is a key factor, considering that the port has been experiencing consistent double-digit growth rates in container traffic over the past 5 years. Port pricing thus has to be in line with the necessary capacity extension and financing of maintenance of the existing and future infrastructure.

The Hamburg Port Authority is the main regulatory body. Within the historical framework of a civic budget it was not possible to react flexibly to short-term capital requirements for ongoing development of user-specific infrastructure, a prerequisite for safeguarding a good competitive position within the North Range. To ensure the implementation of entrepreneurial understanding of port management HPA was taken out from the public budget and required to set-up its own budget in October 2005. Since then port revenue, such as rent and fees, are allocated to port-specific tasks and development projects, and new opportunities concerning additional loans are established.

HPA is the key body for infrastructure charges related to activities in the port. However, terminal charges are not in the area of influence of the port authority. The author has to state at this point that the leasing of terminal areas and quay space is also part of infrastructure charging and should be considered as such. In the long term financing of port infrastructure these tenant agreements are an important part of infrastructure charges, but go beyond the scope of the DIFFERENT project. However, charging practices and concepts of terminal leases are a key factor in creating level playing fields in competitive environments. Currently, the level of rent is determined for 5 years, and depends on the quality of the site (water interface, water depth, rail connection) or the quality of the quay walls.

According to the German law, the Federal States are free to decide about the charging for the use of the public / general infrastructure and the terminal-related infrastructure. Given the demand elasticity and the exchangeability of ports, appropriate investments should be applied by the Federal States which lead to cost coverage by market oriented port dues. The differentiation of port charges in the port of Hamburg reflects a number of issues:

- Aim to recover part of infrastructure costs
- A political mandate
- A response to the competitive environment under market principles
- A strategic reach for specific markets.

### *Differentiation Schemes*

The analysis of the HPA's port tariff book shows a clear differentiation of ship types, traffic regions and ship size. Ships operating in regional traffics, North Sea and Baltic Sea pay a reduced level of port dues. This is part of the strategy and political mandate to strengthen the port of Hamburg as a regional hub port, as it is expected that this measure makes the port more attractive as a port of call for feeder services. Furthermore, regional feeder services call at higher frequencies and thus the lower port dues are offset by a higher frequency of calls (more charging opportunities).

The differentiation by ship type also depicts that ships which potentially present a higher risk are charged more. Oil tankers pay the highest charge per 100 GT. The risk levels of different tanker standards in case of an accident are reflected in the further differentiation between double hull tankers, tankers with segregated ballast water tanks and regular tankers (no double hull, no segregated ballast tanks). The latter pay the highest port dues per 100 GT.

Differentiation in ports historically has been a reaction to specific market development. The changes in the ship size pattern show the need to differentiate port charges in different size categories. Ship sizes in general have been increasing over the last 30 years and especially since 2001. Bigger ships incur other costs and the possibility to serve these ships in the port of Hamburg is highly dependent on the maintenance and further deepening of the channel (Elbe River). Thus it seems logic that the port dues per 100 GT are higher for bigger ships. This differentiation therefore does not give incentives to economies of scale in relation to the transport unit.

A main finding in terms of strategic differentiation is that the terminal operator HHLA in his published tariff book differentiates port charges for ships operating in European long-distance and short distance routes. This level of differentiation of routes goes beyond that applied by the port authority. It can be seen as part of HHLA's Strategy to be attractive to a specific customer group. In this case the target group is defined by HHLA customers that provide a significant number of services between the Mediterranean and Hamburg.

### *Efficiency of Differentiation*

The analysis of traffic by region in relation to the differentiation pattern shows that a clear relationship between the growth of certain types of traffic and the preferential treatment of ships in specific trades cannot be established. This might also be an indicator that the differentiation of port dues does not have a significant impact in the overall decision making of port users. Shipping lines will base their decisions on port calls on the shipper's demands and where they incur overall the lowest costs.

Strategic differentiation related to environmental issues had been attempted by the port, but was not successful, because the costs induced by this differentiation would not be taken on by the public authority. These kinds of schemes can only be successful, if revenue neutrality can be guaranteed for port authorities that are supposed to work under private market principles. The scheme had three significant drawbacks. Firstly, the scheme did not prove to be revenue neutral and due to the institutional set up the received discounts by ship operators had be repaid to the port from the public budget. Secondly, the scheme was politically driven and therefore dependent on the political support, and with the change in government the funding was not secured any further. Thirdly, there was no agreement between the port and the ship operators to strengthen this programme.

The port in its embeddedness within complex transport and logistics chains and its port charges are only one part in a complex system. User reaction to specific differentiation measures can only seldom be measured in their specific impact. In the case of Hamburg cost coverage is a main issue, especially after the conversion of HPA and the independency of the city council. The conversion towards a more private sector like operation of the port authority has its advantages and disadvantages. In relation to differentiation this becomes clear in the previous efforts to implement an environmental differentiation that gives incentives to environmental sound behaviour in terms of emissions reductions.

From the standpoint of the terminal operator HHLA the specific port charges for ships are not decisive in the decision making process of port users. Handling charges and the connection towards the hinterland as well as transport costs within the hinterland are the decisive factors to choose a specific port. The impact of the differentiation of port dues and berthing charges is therefore seen as strategically interesting, but not as a decisive factor. Charges within the terminal are based on individual agreements with the shipping lines and are established under competitive market conditions. The competitive market conditions are created through inter-terminal competition and interport competition. Thus the port sector in this case is no different from any other industry sector.

From the terminal operator standpoint full cost recovery of investments in infra- and superstructures in the terminal need to be given over the lease period. However, in a global market terminal operators that operate terminals in different ports might calculate cost recovery at a company, but not terminal level. The individual operation of a terminal might as well have strategic character.

## 2.2 GOTHENBURG

In an international context, Swedish ports are rather unique, since in most of them the infrastructure is managed by a port company which also provides stevedoring services. The majority of port companies are owned by the relevant city. They are limited companies, which sometimes own the infrastructure, but normally rent the land on commercial terms from the owner. The limited companies were created as a result of a merger between the former port authority and the stevedoring company. One strong advantage is that the ports' customers only have to negotiate with one party. A more recent organisational trend in the Swedish port industry is regional co-operation between port companies.

The fees charged to ship operators in Sweden can be broken down into port dues, and fairway and pilotage dues. The latter are levied by the SMA.

### *Port Dues*

Port companies and port authorities charge fees for the services they provide and dues for the use of fairways and infrastructure inside the port area. Customers pay according to commercial agreements covering both fees and dues. Apart from cargo handling, these services may include storage, clearance and forwarding. Each port company has a stipulated tariff, but this is usually not used; because charges are negotiated, the application of published differentiation can be questioned.

In the published port tariff book the port of Gothenburg differentiates ship types for port dues. As in the case of Hamburg, tankers are charged the highest fees per GT. This fee even increases, if ships do not have segregated ballast water tanks. This differentiation seems a common type to mitigate risks and to create disincentives for the use of low standard ships. Port dues for cruise ships are the only ones that decline with increasing size of the vessel (over 20 000 GT). This might be related to an additional port charge for each passenger. Furthermore, passengers have a significant economic impact as they will create significant revenue in the port and the city.

Environmental differentiation of port dues is a result and strategic succession of the introduction of the differentiated fairway dues in Sweden by the SMA. The Port of Gothenburg has introduced environmentally differentiated charges based on the level of emissions and ship type. In order to analyse the impact on the actual port dues under different conditions, the impact on the basis port dues have been calculated for different ship types. The full implementation of high environmental standards delivers the greatest benefits for all ship sizes and can reach around 6% reduction of port dues for a passenger vessel or ferry per call. In day to day operations with a high call frequency, this level of reduction is perceived to deliver a substantial savings for the ship operator. However, the actual benefit for oil tankers for complying with environmental standards decreases with ship size. In turn cruise ships receive the highest benefit when using ships >20 000 GT.

User reaction cannot be estimated, because the actual payments and used differentiation for port charges cannot be identified. The port of Gothenburg states clearly that prices are negotiable. There is no information in how far differentiation is reflected in the negotiated contracts, or in how far complying with certain (i.e. environmental) standards has an impact on price negotiation.

### *Pilotage Dues*

Pilotage dues are based on the size of the ship, computed on the basis of gross tonnage and distance piloted. Mainly for safety reasons, pilotage dues are kept fairly low by international comparison; cost recovery is approximately no more than 35%. The deficit is covered by fairway dues.

### *Fairway Dues*

Fairway dues are based on the vessel's gross tonnage and they are differentiated according to the type of vessels and their sulphur and nitrogen oxide emissions.

In Sweden, differentiation of charges as a moderate tool of economic incentives has been combined with market forces, policies from transport customers, images of the shipping companies since 1996.

An incentive scheme for differentiated charges of fairway dues in relation to ship emissions was developed. The aim of the system was to reduce the emissions of nitrogen oxides ($NO_x$) and sulphur oxides ($SO_x$) emanating from the shipping to and from Sweden by some 75% until the end of the first decade of the new millennium.[1]

The fee system, due to historical reasons, is based on the gross tonnage (GRT) of the individual ship[2] and for $SO_x$ deductions pending on the sulphur content of the fuel of the ship. For $NO_x$ deductions the fee level depends on the measured $NO_x$ emission at 75% of engine output on all engines weighted and calculated as $NO_2$ in grams/kWh. The system is intended to be revenue neutral for SMA. Therefore adjustments pending on the development were prepared, but never became a reality within the first seven years period.

In order to be qualified, Ro-Pax and railroad ferries have to state their continuous operation on fuel with sulphur content of less than 0.5% S by mass. For cargo ships this level was set up to less than 1% S by mass taking into account their traffic pattern and the availability of low sulphur fuel in Northern Europe. After eighteen months, about 1200 vessels from a total number of 3500 individual ships calling upon Swedish ports were registered for continuous low sulphur operation.

### *Efficiency of Differentiation*

In order to further enhance the introduction of $NO_x$ reducing technology a restitution from paid Fairway dues to the shipping company was granted during the first two years by SMA in order to cover 40% of the total costs of the installation regardless of the ships nationality. From the year 2000 until the end of 2003, 30% was granted and thereafter the restitution came to a stop. Between 1998 and 2004 some 38 vessels had installed $NO_x$ reducing technology and had been qualified through certification and registration. The total annual reduction of $NO_x$ in these vessels was calculated to 41 000 tonnes of $NO_2$. The total engine power - subject to $NO_x$ reduction was 785,000 kW. The socio-economic value of this $NO_x$ reduction based on the ASEK not in list of abbreviations rate of 60 SEK/kg $NO_2$ was calculated to be 2.5 billion SEK (€ 277.8 million).

In 2005 the reviewed environmental differentiation was introduced. Special attention was given to the ferry sector because in the view of the SMA:

- Ferry traffic fulfils a function that may be referred to as “portable bridges” for the more high-value goods traffic and for personal trips requiring high and regular transport frequency. This type of frequent transport is gaining greater significance for the Swedish economy, and thus, in its opinion, warrants a certain downward adjustment of dues.
- Ferry traffic generates considerable revenue onshore.
- Ferries are frequently of a high ice-class and thus contribute to curbing the ice-breaking costs of the Administration.
- A lower increase in dues for passenger vessels is that gross tonnage does not provide a perfect picture of the vessel’s power output and thus neither of the emissions generated.

The SMA introduced fairway dues for passenger vessels of 1.80 SEK/GRT. Interestingly this reduction is not offset by higher charges for other ship types. The main argument is the positive development of ship traffic, which in the view of the SMA seems to be sufficient to provide continued revenue neutrality. The new system also introduces environmental differentiated charges for cruise ships, which were not included in the previous system. SMA’s argument to keep the fairway dues as low as 0.5 SEK/GRT originates from a study conducted by the organisation that came to the result that such a level of charges would not discourage cruise ships from calling in Swedish ports. In order to not create unwanted user responses in terms of route changes or unfair competitive conditions for different cruise lay-outs, a single charge alone, levied in the first Swedish port of call was introduced. For cruises in which more than 90% of passenger replacement occurs in Swedish ports, no dues are charged. The reasons not to fully include cruise vessels in the environmental differentiation system

[1] North Sea Ministerial Meeting on Environmental Impacts of Shipping and Fisheries Issue Group on Sustainable Shipping 1-2 March 2005
[2] GRT gives, with a few exemptions a fair reflections of the amount of installed engine power

are based on the fact that the use of low sulphur bunker oil in all circumstances must be viewed as far too low for meaningful measures to be taken considering the low dues level. As regards the cleaning of nitrogen oxides, it has emerged that measures aimed at reducing these can be expected, and have been implemented in certain cases, and thus a decrease in fairway dues is included in the system.

The need for continuous adjustment related to technological progress in marine engines is reflected in the adjustment of the upper limit for $NO_x$ discounts from 12 g/kWh to 10 g per kWh. Additionally, the scale goes down to 0g/kWh and based on the SMA this is aimed at providing a strong incentive to also include auxiliary engines in measures to cut $NO_x$ emissions.[3]

### *User Reaction*

A main question in order to evaluate the efficiency of the environmental differentiation for the evaluation of its ecologic effectiveness is user reaction. It is estimated that by 2004 80% of the ships calling in Swedish ports used low sulphur fuels. The greatest share of technological upgrades for the reduction of emissions has been built into ships operating in Swedish waters (Ortmanns 2004). The granted subsidies in the scheme resulted in comparatively low costs of reduction measures and had an economically positive impact on the producer of emission-reducing equipment. From this perspective the implementation of differentiated environmental dues can be regarded as a success, since it has resulted in the anticipated user reaction that port users invest in environmentally more sound technologies.

However, user reation from a geographical perspective is very limited, because it is directly related with the level of use of Swedish ports of a ship operator. Ship operators providing services with a wider geographical reach are less tempted to comply with the measures, since the saving in relation to the overall operating costs through the implementation of environmentally sound measures become less the lower the number of calls in Swedish ports. Further, the incentive was not strong enough to lead operators of older equipment to implement more environmental sound technology, because the cost for installing the new technology was not set off buy the savings generated from the differentiated dues system.

Even though the system was not supported by other countries and some operators could not be reached by the system a 10 per cent reduction of SO2-emissions and 30 per cent NOX-emissions were estimated.

The differentiation scheme led to ship operators using less environmental sound technology to pay higher charges in comparison to those complying with the set standards. A competitive advantage for the ship operator could be reached after the investment costs had been paid back through dues savings. The geographic location of Sweden does not permit shifting of port of calls for operators.

Sweden's strategy was favoured by the geographical location, the high interest in the Swedish society in environmental issues and the absence of international agreements at the time of implementation, which did not require compatibility with other systems. The offered subsidies for abatement costs reduced the reservation of the shipping industry towards the new system.

The example of the evolution of differentiation of fairway dues in Sweden also clearly shows the continuous development and adjustment that is required to maintain the effectiveness of these strategic schemes. User responses as a reaction to the changes in the scheme at this point in time cannot be calculated, due to lack of data.

In addition 30 of the major ports of Sweden likewise applied a differentiation of their Port Dues based on data of qualified ships from the SMA. As presented by the example of Gothenburg. The system of Harbour Dues differentiation, however, is out of the influence of the SMA. As a result the ways of application and implementation of this differentiation system vary from port to port.

[3] For more information see: http://www.acidrain.org/publications.htm#kågeson; http://europa.eu.int/comm/environment/enveco/studies2.htm#27

The wide ongoing discussion in Sweden in respect to essential environmental problems has resulted in a substantial rising of common awareness within the shipping community and a positive attitude to come forward with ideas for solutions.

#### *Current Developments*

The SMA is also taking part in ongoing work by the Swedish Shipowners' Association (SSA) and other stakeholders on emission trading between ships and shore industry on European level. Such a system should be open and voluntary in order not to interfere with the work of IMO and can, if properly applied and managed, effectively reduce the overall emission load on Europe at the least cost for society, since effective measures in ships can be performed at one tenth of the cost for most industrial applications.

Through the provision of cost coverage from such a trading system for effective measures taken by ships calling upon European ports, the efficient reduction of air pollution would be safeguarded and pave the way for a rapid change.

With more followers, and a proliferation of incentives elsewhere, for a desirable positive environmental development, a transformation of international shipping into sustainable shipping is possible in a short period of time.[4] However, differentiation schemes might lead operators to shift the less environmentally sound ships to regions with less rigid standards. The pure geographical shift does not solve the problem, even if the results in the region of implementation are positive. This calls for the integration of differentiation in a wider set of measures such as incentives to scrap or upgrade low standard ships.

### 2.3 VALENCIA

The port perceives itself as a hub port to the West Mediterranean, with connections to Northern Africa, Portugal, France, Italy and the Mediterranean countries in general. The regional area of influence for feeder services encompasses 243 consumers in a radius of 2,000 km.

The organisational model of the Spanish port system is intended to increase the competitiveness of the Spanish ports at national and international levels. The national entity "Puertos del Estado" establishes the general management objectives for the port system, providing a specific framework for the internal control of the individual ports.

The aim of the control is to assure the safety of assets, the reliability of the information received from the ports, as well as the completion of set goals. The Spanish port model comprises three essential public institutions, namely "Puertos del Estado" (State Ports), the "Autoridades Portuárias" (Port Authorities) and the "Fondo de Compensación" (Contribution Funds), envisaging the achievement of following aims:

- autonomy of economic and financial management of the public port entities;
- self-financing of the port system;
- optimisation of the economic and financial performance;
- solidarity among the public port entities;
- the right of free setting of tariffs;
- improvement of the competitiveness of the public ports;
- promotion of the participation of private interests on financing and managing public port assets, in particular through the award of concessions for the provision of services or use of port public

[4] More information on this trading scheme/incentive system can be found at: http://www.demoproject.org
EU COM/DG ENV – Shipping future: http://www.europa.eu.int/comm/environment/air/transport.htm#3
EU COM/DG ENV – Shipping conducted projects:
http://www.europa.eu.int/comm/environment/air/background.htm#transport
and the NERA report at: http://europa.eu.int/comm/environment/air/pdf/04_nera_report.pdf

domain areas; this award implies however, that concessionaires have to finance and provide infrastructures and installations, as required by respective activities.

Objectives, among others, include the reduction of transport costs in ports and the promotion of competitive port tariffs by applying correcting coefficients and establishing benefits and underscore the national ports' strategy. From the Spanish perspective, port dues should respond to the general interest of co-modality and the auto-sufficiency of the port system. This means that the revenues generated in ports should cover the operational, financial and fiscal costs and depreciation of goods and installations also allowing realizing new investments and the devolution of the port companies.

### *Differentiation*

The existing differentiation in port charges is determined as follows:

- Private use of ports should be costed in reference to the market value of the occupied port space.
- The level of buoy and signalling dues is based and fixed on the total costs of the national signalling and lighthouse system, considering direct and indirect costs within Spanish waters. Excluded are buoys and signalling for the direct port approach.
- With the objective to promote competition between ports and to increase competitiveness, to increase private investment in infrastructure, to strengthen Spain as an international logistics platform, to strengthen multimodality, to capture and consolidate traffics, special attention to peripheral and insular regions, to give incentives for good environmental practice, and to improve the quality of services each port is obliged to establish specific bonuses in form of differentiation. The maximum limits of differentiation are configured by law.
- E.g. In terms of frequency of calls in a port during the period of one year provided by the same shipping company, the shipping companies should receive the following discounts:
  - 1 – 12 calls: 1.00.
  - 13 – 26 calls: 0.95.
  - 27 – 52 calls: 0.85.
  - 53 – 104 calls: 0.75.
  - 105 – 156 calls: 0.65.
  - 157 – 312 calls: 0.55.
  - More than 313 calls: 0.45.

Port services may be rendered directly by Spanish Port Authorities or indirectly by other bodies recognised under the laws governing Spanish ports. The rendering of such services requires the payment of certain tariffs:

- Port fees as payment for the private use or special exploitation of public domain territory in ports, and as payment for non-commercial services rendered by Port Authorities.
- Port tariffs as payment for commercial services rendered under systems of competitive pricing and having the character of private prices.
- Tariffs for basic services which have been allocated under licence by the Port Authority to third parties.
- Official terminal tariffs corresponding to operations of loading, unloading, stowage and unstowage and transhipment of goods from vessel to vessel and within the port zone.

In addition, there are a series of discounts on fees that that port users have the right to enjoy. These discounts are stipulated under sections 19 and 27 of Act 48/2003 on the Economic Regulations and the Rendering of Services in ports of general interest.

As described in the previous cases, it is not clear whether this differentiation and the application of discounts are reflected in the negotiated tariffs.

*Efficiency of Differentiation*

The application of similar differentiation measures over a wider geographic area, in this case Spain, in general contributes to the transparency and comparability of port dues. However, the real competitiveness in environments where port dues are negotiated seems questionable. The port of Valencia in its official tariffs provides strong incentives for frequent use, and special incentives are given to SSS and ferry services which receive stronger discounts than other ship types. These ideas are in line with the policy of the Commission and as such seem of high strategic nature. This refers to special treatment of SSS and incentives for compliance with quality standards.

Figures from the port of Valencia have also shown that, in general, not the traffic with high discounts has contributed to the latest growth rates in the port. This raises the question in how far the market responds directly to incentives through differentiation and whether differentiation is only effective in combination with other measures.

Further, assuming that discounts are brought forward in the negotiated charges with shipping lines, the application of the published discount scheme might imply additional costs for the port authority, if especially highly discounted traffic grows. Therefore, it is not clear whether a national differentiation scheme can suffice to at least create revenue neutrality for the port authority.

## 2.4 AMSTERDAM

The port of Amsterdam is to a great extent a commercially independent public body. The port is responsible for raising its own finance and for carrying out investments. Their investments can be divided into two types:

- Investment in general port management and infrastructure;
- Investment in user-specific infrastructure.

The first one falls under the general responsibility of the port authority, as manager of public assets and as safeguard of the broader public interest. The second type entails infrastructure provision for a specific user and may be motivated by the need of the port to strengthen its strategic position. The only type of investment that falls in the latter case under the responsibility of the port authority is port terminal related infrastructure (excluding terminal equipment and superstructure that is in principle the responsibility of the terminal operators).[5]

In general, the port authority does not receive financing from either national or local authorities, and port investment is performed (with the exception of access infrastructure) exclusively on the account of the port authority and/or of private operators and investors. Nevertheless in order to correctly understand the link between the port authority and the respective municipality, it is necessary to distinguish among the two specific cases in the Netherlands; the case of the corporatised port authority (Rotterdam) and the case of the Municipal port Authority (Amsterdam).

The income of Dutch port authorities consists of lease revenues from land granted to private operators, quay dues and harbour dues. The major source of income for port authorities are port dues that account for approximately 55% of their total revenues. Leases and rents are the second source of income, and account for approximately 40% of total revenues. Minor sources of income are revenues from periodical passes for inland shipping, and Vessel Traffic Management System fees. The revenue structure underscores the importance of effective and attractive pricing for the port authority. User reaction on infrastructure charges is crucial to the overall revenue and profitability of the port.

Port authorities charge the terminal operators in two ways, through:

- Sale, rent or leasehold of land;
- Quay fees.

[5] ISL (2006): Public financing and charging practices of seaports in the EU. Bremen. Germany

Rents, leases and quayage in Amsterdam were € 54.1 million (2006) and € 52.7 million (2005), which are charged to the terminal operators. Seaport dues were € 33.4 and € 29.6 million in the same period, while inland harbour dues resulted in € 3.4 and € 3.3 million of income to the port. This means port and harbour dues make up around 37% of the overall operating income. Seaport and harbour dues are charged directly to the ship operator. User reaction from ship operators in terms of port usage can have significant short term and medium term effects. These charges are up from € 23.8 million and € 2.6 million respectively in 2003.

### *Differentiation*

The Amsterdam port authority uses a differentiation of lease rates to attract specific companies for specific sites. This is done by using a land price model. Every year the city council determines a list of base prices. The actual land price for a specific site is then determined by the base price and by taking a series of factors into account. These factors concern both the specifics of the site (e.g. quality or location of the site) as well as of the company that wants to lease it (e.g. branch or specific activities). Because of this method, companies may pay different amounts for the same site.

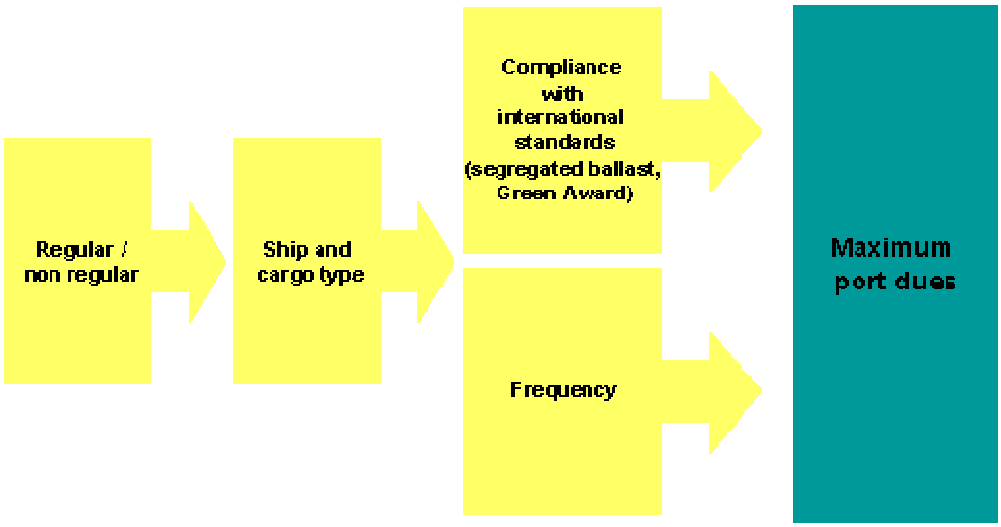
Leases are adjusted yearly according to inflation. The port uses the official Dutch inflation index of the year before, compared to the inflation index of six years earlier. Strategic considerations do indeed play a role in the setting of lease fees, and the specific port business model adopted may have more influence on leases than cost considerations alone. It should be noted in this respect, given the long time horizon over which lease fees are set, that port strategies may change in the course of the lease agreement and, consequently, lease fees may differ from terminal to terminal, depending on the captivity of the type of traffic, competition with other ports, the role of integrated logistic operators and market conditions related to port dues for the various types of traffic.

The port of Amsterdam charges quay fees to the terminal operator. The charge is payable by the metre of quay. The price is differentiated by the water depth at the quay and the type of the quay (e.g. bank or wall). The port authority charges this fee for maintenance of the infrastructure. The charge is independent from the level of use. Generally quay fees are passed on to the ship operator in the handling charges.

In contrast to other countries, the general structure[6] of port charges is, in The Netherlands, decided at national level. The port of Amsterdam has the freedom to determine the level and differentiation within the given structure for its charges, dues and fees. The port of Amsterdam has decided on a level of differentiation that reflects on the diversity of traffic in the port.

The port of Amsterdam gives two options of calculation of port dues: based only on GT or based on GT and cargo transferred in the port. Differentiation is nested and interdependent with specific conditions. The final level of differentiation delivers a significant number of differentiation options. However, it needs to be kept in mind that this is the theoretical approach, since customers often negotiate special prices, especially, when frequent and long term customers. For the differentiation the port uses the following pattern:

[6] Structure refers to the type of charge to be levied: port dues, quay dues etc.




*Source: Author, based on port of Amsterdam*

**Figure 2-1 Pattern of differentiation of port dues - Amsterdam**

Harbour dues for seagoing vessels are collected by the municipality/port authority. They depend on ship size (GT) and the amount of cargo loaded or discharged during the visit. It is the port that determines the amount per GT or per tonne loaded or unloaded. The rate is charged on the basis of the time spent in port. For ships in lay-up there is a separate rate. A distinction is made between ships that sail in liner services and others. Also, there are discounts on the basis of the number of visits in case of feeder or short sea vessels. The price structure is fixed, but it is hard to summarize the minimum and maximum charge due to the numerous factors playing a role in the price definition and the nested structure. The reduction for the compliance with the Green Award for certain bulk ships is 6% of the port dues, and in case of tankers having segregated ballast tanks it is 17% on the port dues. Furthermore, reductions on the base rate refer to the frequency in calls. This reduction is between 10% and 35%, on the respective base rate for a specific ship type.

In the port of Amsterdam most quays are part of a terminal and therefore leased with it. In these cases a quay fee is paid by the terminal operator to the port authority. In that case, quay dues are included in handling costs, charged by the terminal operator to the cargo owner. Only when a ship uses communal quays, the port authority charges the ship-owner directly. The Amsterdam system depends on the size of the ship (GT), the duration of the use of the quay, and the specific type use.

## 2.5 DUISBURG

The port of Duisburg is Europe's biggest inland port; the port is operated by Duisport. The port operates in a competitive environment for transport links towards the main export and import gateways (Rotterdam, Antwerp, Hamburg). The main competitors of inland river transport services are rail and trucking.

The port's infrastructure charges are differentiated in the "Hafengeld", which are the ship related port dues and the "Ufergeld" which is related to the volume of cargo moved across the quay. The existing price differentiation has developed historically and focuses on cost recovery and market requirements. In this regard the competitive position towards other transport modes plays a significant role.

Port dues are differentiated by gross tonnage. In the case of sea-going barges, port dues will be calculated as a function of the registered gross tonnage. The actual charge of port dues is then differentiated by the length of stay and activity of the ship. The main strategy is to keep berth occupancy low. Thus, ships that spend only up to 24 hours at the berth are charged only a fraction of the dues charged to a ship staying between 24 to 72 hours, or even longer.

Further differentiation is given to the type of activity. Ships that are not performing loading or unloading operations are charged differently to ships moving cargo across the quay. Ships that are not performing cargo movements are charged relatively higher prices in order to encourage port activity, especially since loading and unloading activities create further revenue in terms of wharfage.

The wharfage charges are differentiated by product classes. The differentiation by product classes is related to the average value of the product and thus the price elasticity.

A key difference to other ports is the nature of traded products in the port and a significant volume of port operations is based on long term commitments. In specific cases these agreements have a length of 20 to 25 years.

The long term characteristics of most activities in the port have led to an open environment between the port operator and the users. User reaction is also little since the flexibility of users in terms of location choice is limited. Further, the low frequency of changes to infrastructure charges and the overall level of change can be justified. Duisport argued that the accompanying information process to changes is a key factor in acceptance by users. Duisport works at high transparency level arguing that all prices are fixed. Duisport's argumentation is based on the high level of quality of service and long term business relationships with its customers. The port also benefits from a complete intermodal concept, integrating rail, road and waterborne transport. Finally duisport is the biggest inland port in Europe and a key point of interchange. This strategy is underlined by the fact that each port user can easily calculate his port infrastructure charges in the internet.

Duisport is not anticipating introducing further differentiation of charges. The company argues that there is no scope for further differentiation. In relation to externally imposed differentiation schemes the main question from the port's perspective is who would cover potential revenue gaps since the port is working on a cost recovery strategy.

## 2.6 SHETLAND ISLANDS

### *Sullom Voe*

The port of Sullom Voe is a major deep water oil port and is owned and operated by Shetland Islands Council as Harbour Authority. The Sullom Voe oil complex is operated by BP Exploration Operating Company Ltd on behalf of a consortium of oil companies. The complex currently receives oil by pipeline from the oilfields in the East Shetland Basin and by shuttle tanker from the Schiehallion oilfield west of Shetland. The oil is exported from Sullom Voe by tanker and shipped worldwide.

Shetland Island Council, in charge of the setting of port charges in the port of Sullom Voe, has changed the structure of port charges in such manner that they work towards consolidated port charges for tankers. The consolidated charge is made up from the shipping dues, mooring charge, pilotage charge and B&L charges. Differentiation is applied between ships with segregated and non-segregated ballast tanks.

A further differentiation is related to the type of port infrastructure used for operation. The charges applied by the port authority on ship to ship transfer are lower than the regular ship dues. Further, charges are only applied to the importing vessel. The exporting vessel is free of charge. Interestingly, the port authority does not differentiate between ships with segregated and non-segregated ballast tanks. This reflects a discontinuity in the strategy.

The strategy is to make port charges as transparent and simple as possible. However, in the case of Sullom Voe it has to be kept in mind that the port only serves one customer. Nevertheless, the port is in competition with other ports for oil storage and, therefore, the port authority stated the importance to have a competitive port charge. The effort to reduce the complexity of port charges can be seen as a response to decreasing port throughput in the last years.

*Lerwick*

The port of Lerwick is operated as a trust port. Differentiation from the perspective of the trust port has to be seen as a continuous process which evolves out of market requirements or reaction to certain market demands. The changing needs of port users, fishing, oil, ferries and tourism industry and the Shetland community represent a diversified set of demands.

Differentiation of charges is not much different to structures found in other ports. The port authority also stated that charges are negotiable and that all published figures are maximum figures.

Differentiation in the case of the port of Lerwick is not seen as a tool, but as a result of the market evolution and a response to the strategic goal of profit making. The positive development of revenues from port dues hints that the existing differentiation is aimed towards profit maximisation, but has a high sensitivity to its economic impact on the Shetland Islands. The port operator at the same time is well aware of the wider impacts of the port on the islands' economy and thus stated that the general level of dues will be considered and continuously reviewed in this context. As a Trust Port, the Authority reinvests profits into the maintenance and development of the harbour to ensure the varied requirements of customers continue to be met.

Being on an island, all companies exporting goods face an extra cost for getting them to their final destination. It is crucial that this cost is kept to a minimum so that they can compete. A study (A B Associates, 2007) estimated that freight costs for the white fish industry add around £160 per tonne of fresh fish in transport to Aberdeen. This equates to adding around 15% onto the sales price of whole whitefish transported to the south.

The same study states that the cost of transporting store lambs to Aberdeen has been close to or even greater than the sales price, primarily due to very low lamb prices rather than a rise in transport costs.

Interestingly the Port Authority acted, by introducing a new differentiation to the charging scheme. The new charging system, introduced in 2006, charges livestock by lane meterage rather than on a per head basis. This has resulted in lower freight costs. The new charging system favours shipping of great quantities rather than individual animals. In this case, changes in differentiation have responded to the local economies needs in a very particular manner. The local level of decision making also allowed for short reaction time.

The port of Lerwick is a good example to underscore the question in how far private operators can be obliged to use a specific differentiation scheme. This is especially true for ports operating under private sector principles (e.g. trust ports) and ports which serve very specific and or isolated hinterlands, like the ports in Shetland.

# 3 PORT INFRASTRUCTURE CHARGES IN THE CONTEXT OF OVERALL PORT CHARGES

A main concern of users is transparency and fairness of port charges. Users seem to be very susceptible if the price structure is to their disadvantage and will make their decisions on port use accordingly.

Carriers and shippers quote that total port charges constitute a significant part of their total transportation costs. Also carriers (shipping lines) are confronted with an increasingly competitive environment in shipping markets and must pursue ways to reduce the total shipping costs to gain a competitive advantage. With the implementation of bigger vessels and hub and spoke networks overall port charges become a major source for shipping lines to cut down total voyage costs. Therefore carriers usually look for the cheapest and most reliable option and eventually use their market power in a certain port to negotiate preferential tariffs. Within the range of port charges Trujillo and Nombela (1999) evaluated cargo handling charges of being the most important for port users in terms of total charges.

Trujillo and Nombela (1999) argue that port charges can constitute an important variable in the choice of a particular port by carriers and shippers. However, they deliver evidence that the role of port tariffs on the use of infrastructure is by far outweighed by other charges. Based on Stuykens (1996) Trujillo and Nombela estimate the relative weight of port tariffs on the use of infrastructure to be between 5% and 15% of all port charges (see **Error! Reference source not found.**).

**Table 3-1 Relative weight of different port charges**

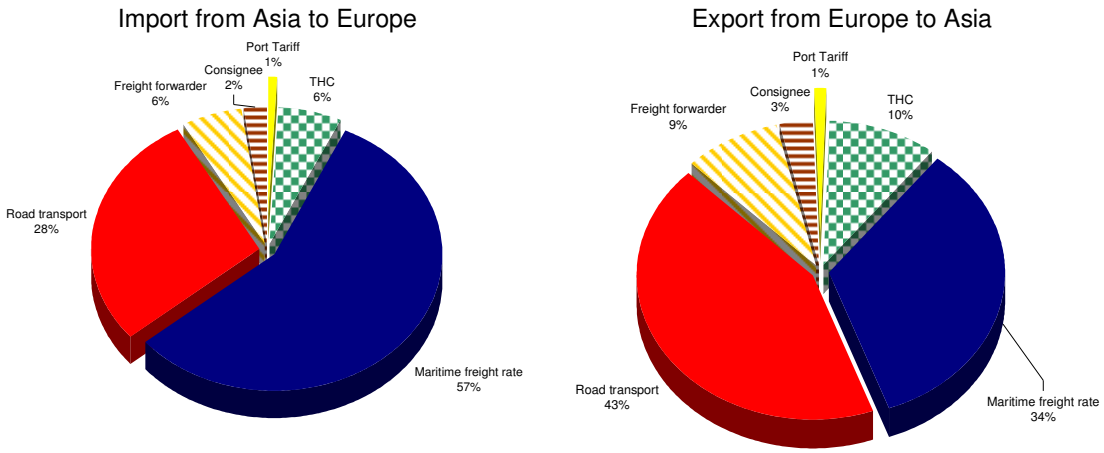
| Type of charge | Percentage of total bill |
|---|---|
| Port tariffs on the use of infrastructure | 5% - 15% |
| Berthing services | 2% - 5% |
| Cargo handling | 70% - 90% |
| Consignees | 3% - 6% |

*Source: Stuykens (1996)*

With the assumption that port charges make up only 5-15 per cent of overall transit costs for deep-sea shipping compared to 40-60 per cent for vessels engaged in short sea trades (European Commission, 1997) the impact of differentiation and respective user reaction of port tariffs has to be analysed in relation to its weight on the total voyage costs.

In this line ISL (2006) estimates the port costs in Ro-Ro-shipping to range between less than 10% to more than 20% of total sea transport, depending on ship size, route length, ship age, bunker costs etc. If the concept is extended and the importance of port tariffs is looked at from a logistics point of view, research from ALG (2006) shows that port costs only account for 1% of all logistics costs in the trade between Europe and Asia (see Figure 3-1) in imports and exports.

**Figure 3-1 Cost distribution in transport chain between Europe and Asia, 2006**




*Notes: calculation based for transport of one FEU on the following routes: Import: Hong-Kong – Antwerp – Frankfurt and Export: Frankfurt – Antwerp – Hong-Kong*
*Source: ALG, 2006*

A further example given by Maennig and Sames (2000) describes that for German ports factors such as the value of the goods at the destination, available infra- and superstructure at the port and the land- and seaside accessibility of the port are more likely to be important to routing decisions of carriers and shippers than port dues.

From the above it becomes also clear that certain traffics are more susceptible to changes in port dues, because they are affected more. This is for example the case for SSS[7] services that call in a greater number of ports than overseas services with port costs playing a greater role in the overall bill. Given the relative small share that port dues account for in overall voyage costs, especially for overseas services, it could be assumed that in theory port authorities can raise and lower tariffs with a wide margin without affecting their demand levels. Especially when it comes to port infrastructure charges (port dues) for ships deployed in overseas container services. The author argues that discussion on differentiation of port dues is rather strategy driven than cost driven, because the obtained advantages or disadvantages are potentially marginal and common sense has it that these charges are passed on to the end user anyway.

The fact that port charges have different payers and recipients creates a further restriction to the effectiveness of differentiation of port infrastructure charges. Port infrastructure charges and cargo handling charges are in general invoiced by two different parties: the former by the port authority and the latter by the service provider (e.g. terminal operator). Based on the assumption that port infrastructure charges are only a small portion of all port costs, the decision to use a port will rather depend on the charging structure and level of the terminal operator, whose operation incurs the highest cost to the shipping line. Consequently the success of any differentiation strategy heavily depends on the attractiveness of the terminal operator to a shipping line and the shipper.

Beyond costs carriers perceive the ship's port turnaround time as crucial, because they have to meet the high demands of their customers. Thus the costs incurred through delays and low productivity potentially are ranked higher than the port infrastructure charges (port dues). Tongzon (1995) shows that the reliability considerably affects port choice of shipping lines and shippers. He concludes that carriers and shippers will most likely bypass unreliable ports even if they offer the most attractive price among the range of competitors.

[7] In this study the European Commission's definition of SSS is used, namely: "the movement of cargo and passengers by sea between ports situated in geographical Europe or between those ports and ports situated in non-European countries having a coastline on the enclosed seas bordering Europe. Short-range maritime transport covers national and international maritime transport, as well as feeder services, along the coast and from/towards the islands, rivers and lakes".

Notteboom and Winkelmans (2001) argue that port authorities and port operator have to present inimitable durable competences. Price differentiation i.e. for environmental performance can be a means to present and promote service differentiation and to brand the port's services to reach competitive advantage in a steadily increasing competitive environment. Tongzon and Wu (2005) provide empirical evidence that the selection preferences of carriers and shippers are based on their service network instead of performance.

Differentiation of port infrastructure charges as seen from the political perspective is only to a much reduced extent a facilitator of certain developments (such as environmental goals). Evaluating the effects of port charges differentiation, the arguments from Notteboom and Winkelmans (2001), that successful ports must constantly be prepared to adopt new roles in order to cope with the changing market environment, become of central importance.

# 4 EFFICIENCY AND USER REACTION TO DIFFERENTIATION OF PORT INFRASTRUCTURE CHARGES

## 4.1 DYNAMICS OF DIFFERENTIATION

Strandenes and Marlow (2000) argue that discriminatory charges are a main characteristic of traditional port charges. They base their arguments on statements from Talley (1994) and Svendsen (1967), which are argue that e.g. Tasmanian ports discriminate between imports and exports. While this might be true, the author argues that specific differentiation regimes are rather based on growth strategies than discrimination of specific users.

The approach of differentiated port charges can be driven by a port's own strategic decision, following the approach from UNCTAD (1995), or can be of voluntary manner in order to anticipate certain developments, which are driven by external influences (e.g. environmental policy at national level). The main difference between strategic and voluntary differentiation is that in theory a voluntary differentiation scheme has to be revenue neutral to be attractive for implementation, is imposed externally and, shall not impact negatively on the competitiveness with other ports.

Examples for voluntary differentiation schemes aimed at improving quality of shipping can be found in the Port of Amsterdam. Voluntary differentiation in the environmental domain can primarily be found in the Swedish port sector, which has evolved from the differentiation scheme introduced in the Swedish fairway system.

Strategic differentiation driven by a port's own decision can be driven by ad hoc profit maximisation of a certain user group or a long run strategy in market expansion. Consequently, it will not necessarily be revenue neutral. These are prevalent in many ports as they favour certain traffics over others or try to attract certain traffics to increase the port's strategic position within the global and /or regional port system.

A principal argument found in relation to the origin of existing differentiation of port infrastructure charges is that this has evolved historically. While this basic argumentation is correct at the same time it is not sufficient. However, this basic argument provides some very important insights into differentiation.

- Differentiation is not static, but it is a process
- Differentiation to be effective needs evolution
- Differentiation has been used a response to market development and political interests.

Thus, when it comes to the analysis of user reaction and efficiency, it has to be assumed that differentiation schemes follow a lifecycle pattern. This means that short and long term effects for the same differentiation scheme might differ substantially over time. Or said in another way, if the differentiation scheme does not adjust, efficiency or the responsiveness of users might be lost.

## 4.2 MAIN FINDINGS

Port charges have a high level of differentiation. The historic development shows that differentiation has been used to address and eliminate inequalities as perceived by users of the system. In a market driven environment with increasing competition, differentiation of services is a principal means of port strategy. Differentiation of prices is a way to express and present the port's strategy.

Main findings throughout the project in relation to user response and efficiency of differentiation of port infrastructure charges are:

- Port infrastructure charges as presented in the public domain are highly differentiated.
- Whether this differentiation is maintained during the negotiation of charges between the user and the port operator and or port authority is not known.

- Elasticities depend on the type of traffic:
  - Traditionally, experts agree that demand for port services is relatively inelastic with respect to port prices in overseas container shipping.
  - The variation in the role of port costs for different shipping sectors and markets in the overall transport costs means that elasticities vary as well. Port infrastructure costs weigh the highest in overall port costs in Feeder services and intra European RoRo.
  - In the ferry sector, for short distance and passenger ferries in public transport networks usually different approaches can be found to infrastructure charging. The most common are flat rate charging over a specific period of time.

Price structures and types of differentiation have evolved historically as a response to user/market pressure. Pressures originate from ports competing in regions with overlapping hinterlands or where ports compete over transhipment markets. Additionally, ports might have to react to demands from shipping lines, especially if a particular shipping company has a significant market share of traffic in a port. Ports are likely to face analogous pressures from customers, since shipping is a global business and especially in ports of call of main container lines pressures will arise from international strategies of shipping lines.

At a further level, pressures to act might be influenced by specific local or national policies as in the case of environmentally differentiated dues in Sweden.

The main motivation of ports to act is driven by economic considerations, which reach from maximising port throughput at port level and/or maximising the economic benefit of port activity in the area of influence of a port. This significantly influenced by the geographical setting of a port (e.g. Lerwick).

### *... in terms of user reaction*

User (shipping lines) reaction to specific price differentiation schemes in ports is not measurable, because users calculate costs in terms of overall voyage costs. In specific cases costs for whole logistics chains are laid out for the decision making process. Shipping lines are costing processes rather than thinking in tariff structures. This potentially omits directly identifiable reactions to specific differentiation schemes.

- User reaction will differ depending on the shipping market. Elasticities for different markets in relation to the reaction on price differentiation cannot be calculated at this point. However, reaction will depend on the embeddedness of a port in a logistics or supply chain, the shipping lines strategy and the destination of origin of the cargo. Based on this, user reaction is most likely to result in a location change either between terminals within a port or to another port, depending on the accessibility of the hinterland.
- In the overall costing the impact of the differentiation of port dues should not be overrated.
- Differentiation is rather important for the port (port authority) in terms of implemented pricing schemes (SMCP, LTMP, etc), when it comes to the calculation of revenues and investment in port infrastructure

### *... in terms of efficiency:*

- From a historical perspective, differentiation of port infrastructure charges can be seen as efficient since differentiation has evolved from market requirements, has been driven strategically and in many cases has potentially contributed to expand markets or indirectly induce positive economic effects in the ports area of influence.
  However, given that most port charges are negotiable and differentiation then becomes a black box, it is not clear how far differentiation schemes are applied and reflected in negotiated prices; therefore, efficiency can be questioned.

- In a market driven environment, externally induced differentiation schemes can potentially inflict on the efficiency of pricing, if they are not at least revenue neutral or if they are static and do not react to market developments (e.g. the technical advancements in emission reductions).
- Differentiation schemes aiming at elevating the quality of shipping and risk mitigation are not efficient, if they lead to a geographical reallocation or shift of service mobile entities (ships), but do not induce improvement, even if they show success in the area of implementation.
- The relatively small role of port infrastructure charges in overall voyage costs potentially infringes the efficiency of differentiation, if differentiation is applied as a stand-alone strategy.

Differentiation of port infrastructure charges is one of many economic instruments a port can use to secure its market position. In relation to strategic differentiation and potentially using differentiation as a means to deliver towards certain policy goals the following questions arise:

- Is it sustainable to artificially introduce differentiation into a market driven sector to reach certain policy goals?
- Can externally induced differentiation schemes be efficient and effective in the short and in the long-run? How can the adjustability of such schemes to market development be guaranteed?
- What is the most effective administrative level of implementation? Is it at port, national, or European level?
- With the commercialisation of port, and also port authorities, in many countries ports are no longer state entities and all externally imposed differentiation would need at least to be revenue neutral. Otherwise it may not be sustainable in the medium and long term, if funding is not secured. And would the creation of funds to finance differentiation to meet a certain policy goal not have to be considered as subsidisation? Subsidisation does not create fair competition and currently the development is towards eliminating subsidisation in ports.
- In how far does the measure maintain a level playing field with competing transport modes? This is especially important in SSS transport.

It has been found that differentiation in the port sector has proven to deliver towards certain development goals; however, this has always been in connection with parallel accompanying measures and in strong cooperation with the shipping sector. It might even be said that the differentiation of port dues is a supporting measure of wider policy concepts. In the following, examples for strategic differentiation are presented.

## 4.3 DIFFERENTIATION BY SHIP TYPE

Historically, port dues have been based on the GT measurement. ISL (2006) argues that the differentiation of port dues of different ship types originates from a distortion which is created by the use of GT as a measure for port charges. Using this scale factor, Ro-Ro vessels and car carriers are unable to reduce their interior volume and thus face disadvantages in comparison to container ships. This argument has been strengthened by the evolution of container ship design, which has constantly increased the cargo stored above the deck; in this manner, the relation GT to the cargo loaded has been changing. ISL therefore refers to the existing differentiation by ship type as an adjustment factor to counteract the distorting effect of GT as a basis for port charging.

In 2000 ECSA raised the issue whether port service tariffs (towage, pilotage, mooring and port dues), when structured on tonnage measurement (in accordance with the London Convention of 1969), fairly or accurately price the amount to pay for port service workloads rendered. The Association argued that GT (or NT) based tariff costs only reflect the volumes of the vessel and not the actual workload received from the port service in terms of working hours and/or required maritime, navigational or vessel handling skills in relation to other vessels of similar dynamic characteristics such as length overall or operating draft. The main argument was that this creates "artificially" high tariff related port costs to vessels of high sided designs such as Ro-Ro vessels, again in relation to other vessel types with designs allowing sometimes 2/3 of their cargo carrying capabilities to be on deck and therefore outside the scope of the 1969 tonnage re-measurement convention. A corresponding situation applies to open-top container ships and car carrier vessels.

These findings called for a review of port tariffs and to move towards a fairer system, because that situation was creating commercially-effective cost barriers for Short Sea shipping to compete with the other transport modes of road and rail.

The basic demands from industry were:

- Maintain the GT (NT) basis, but introduce a co-efficient factor to bring High sided vessels in line with other port users - e.g. Zeebrugge has a dividing coefficient of 2.5 on the GT of a RoRo / Car carrier type vessel.
- Maintain the GT (NT) basis, but decrease the percentage dependency on GT and proportion a certain percentage against cargo tonnes handled. Due to the inherent nature of cargo weight tonnage for high sided vessels, this will allow a fairer equilibrium of level of costs e.g. Le Havre.
- Adapt the tariff structure to create entries pertaining strictly to Short Sea operators and RoRo / Car carriers – Hamburg's and Valencia's port tariffs are geared towards a Short Sea friendly set of tariff items specifically to encourage and enhance the Short Sea trade.

Regarding ship types, several ports within the European Union (EU) have adopted a scheme to give incentives to intra-EU shipping services by lowering their charges for ships operating in intra-EU regular liner services. This strategy is specific to container shipping services. The reasons for this strategic pricing option are manifold.

Firstly, a preferential tariff for intra-EU/SSS services is in line with the EU policy to strengthen waterborne transport and to shift intra-EU traffic from road to sea.

Secondly, port administrators in general have incentives to increase or maximise throughput of the port, which also strengthens their position within the port hierarchy in the region. In order to be attractive for mainline services, ports are in need to attract a high level of feeder services which provide the fine distribution within the region.

Thirdly, regional or SSS services have shorter turnaround time and frequent port calls. As a result, port costs for these services are significantly higher in relation to overall costs. A differentiated port charge thus makes sense in attracting SSS services to a port.

Currently discount schemes for SSS are relatively widespread throughout the EU. The port of Hamburg differentiates in its vessel dues between overseas, long distance European and short-distance European routes. In comparison to overseas routes, vessels coming from long-distance European route receive a 14% discount on the vessel dues. For short distance European routes this discount reaches 42%.

The port of Le Havre offers a 70% discount for feeder vessels with a length of less than 140 m on the basic ship dues, if they deliver or receive cargo from mother ships in the port of Le Havre.

The port of Amsterdam grants ships operating in regular SSS services a reduction between 20% (container) and 39% (roll-on/roll-off) on the ship dues in comparison to the basic vessel dues.

The port of Valencia grants roll-on/roll-off vessel operating between EU ports a 50% discount on ship dues and 20% to all other ships rendering regular services between EU ports.

## 4.4 DIFFERENTIATION MITIGATING RISKS "SAFETY AND POLLUTION"?

Quality of shipping is mainly related to security and accidents. Due to the nature of the market and products, handled liquid bulk shipping receives the greatest attention in this matter. Success of the implementation of quality shipping is highly dependent on the industry's willingness to technical and procedural evolution. One example is the Green Award.

The Green Award system was launched in 1994 based on an initiative by the port of Rotterdam. The programme was designed to give an incentive for large liquid and dry bulk vessels to increase their

attention to safety and environmental protection. The Green Award is given to ship owners, if their vessels, crews and procedures comply with a number of requirements in the operation and specifications of the ship. Currently, 200 dry bulk ships and tankers have been certified, belonging to 38 ship owners. Within Europe a number of ports give incentives in form of differentiated user charges to certified ships.

Due to the origin of the initiative, a discount scheme is most widely practised in the Netherlands, where also a number of nautical service providers offer discount schemes on their tariffs, if ships are certified with the Green Award.

Table 4-1 shows that the general level of discount granted on port dues varies between 3% and 6%.

**Table 4-1 Green Award Incentive Providers – August 2007**

| Country | Port | Discount | Type of charge |
|---|---|---|---|
| Belgium | Port of Ghent | 6% | Port fees* |
| Lithuania | Klaipeda State Seaport Authority | 5% | Vessel dues |
| Portugal | Porto de Sines | 5% | Tariff of port use (TUP) |
| | Portos do Douro e Leixoes | 3% | Tariff of port use (TUP) |
| | Porto de Lisboa | 5% | Tariff of port use (TUP) |
| | Porto de Setúbal | 3% | Tariff of port use (TUP) |
| Spain | Puertos del Estado** | To be defined | |
| The Netherlands | Amsterdam Port Authority | 6% | Port fees* |
| | Port of Rotterdam | 6% | Port fees |
| | Port of Dordrecht | 6% | Port fees |
| | Moerdijk Port Authority | 6% | Port fees |
| | Zealand Seaports | 6% | Port fees |
| United Kingdom | Port fo Sullom Voe | 5% | Harbour dues |

*Notes: *for Crued oil/Product Tankers and for Cargo Bulk Carriers. ** Bilbao, Santander, La Corunia, Huelva, Bahia de Cádiz, Bahia de Algeciras, Málaga, Cartagena, Valencia, Castellón, Tarragona, Barcelona, S.C. de Tenerife etc. for details see www.puerto.es*
*Source: www.greenaward.org (01.Aug 2007)*

Interviews with the Port of Amsterdam and the Port of Sullom Voe, however, have shown different perceptions of the scheme, its effects and validity. The port of Sullom Voe (February 2007) stated that the discount of 5% is no longer granted, because all ships calling at the port comply with the Green Award requirements in any case. Therefore the differentiation scheme seems to have fulfilled the purpose and has concluded his life span.

The perception at the port of Amsterdam is significantly different and the Green Award discount is part of the ports marketing strategy as a “green” port. The difference is the geographic location, where Amsterdam is right next to the city, while Sullom Voe is located in the remote North of the Shetlands main island with no human settlements close to it. This might be one main reason for promoting a green image, or the necessity to do so, in Amsterdam.

A further difference is that Sullom Voe is a highly specialized oil port, serving one main customer. Since the customer is ISO 14000 certified, the Green award certificate is somewhat redundant, because the specific standards for operation are set by the ISO certificate.

Using differentiation to give incentives to apply higher quality standards in ports seems a very reasonable approach. However, the findings suggest that the existing differentiation schemes are set up as static and have not progressed over time. In case many ships calling at a port do already comply with the standards, or are holding a specific certificate, no advantages beyond a certain marketing effect for the stakeholders exist. The need of adjustment to maintain effectiveness of a differentiation scheme has become clear in this respect. A differentiation scheme is only valid, while it is effective otherwise it just adds to the complexity of a charging scheme and increases the potential of misinterpretations or rejection of a scheme.

For a port the participation in such a scheme might be interesting beyond the marketing effect, because it can offer insight on the elasticities of users. Since the total number of certified schemes, such as the Green Award is known, it can be evaluated if the calling pattern off certain ships and the overall calls of Green Award ships change. This could potentially give some insight on the efficiency of differentiation measures.

Krause (2006) argues that a key issue is the origin of the incentives and schemes, because schemes like the Green Award are private sector driven and can only be implemented, if a port recognizes these schemes. The implementing body in the port, private or public needs to see advantages, such as improved image or risk reduction, in order to be willing to grant discounts to ships complying with the respective standards or holding the respective certificate. Since incentives to comply with those standards are usually of discount character the port body also needs to be ware of the available long-term counter-financing possibilities. Otherwise the result might be similar to the trial of differentiated charges for shipping in Hamburg, which could not be sustained because of missing financing of incurred losses by the differentiation scheme.

In the case of the Green Award scheme it might be concluded that the attractiveness of the scheme is relatively small and difficult to isolate, which might be reflected in the relatively little geographic spread of differentiation schemes which incorporate incentives for complying with this standard.[8]

## 4.5 DIFFERENTIATION TO REDUCE EMISSIONS FROM SHIPS

The move towards more environmentally sound shipping is receiving increasing attention. The biggest attention has been given to emissions so far.

Shipping is largely an international business, a logical step is to try and bring about global agreements to limit its emissions. The institution dealing with this matter is the Marine Environment Protection Committee (MEPC) of the United Nations' International Maritime Organisation (IMO).

Following several years of negotiations, agreement was reached in autumn 1997 on an air pollution annex to the MARPOL 73/78 Convention. This was however very weak, and it is obvious that it did not have any major effect on reducing emissions from shipping. The voting rules of this convention and experiences so far indicate that any significant moves to reduce emissions of sulphur and nitrogen oxides from shipping by the IMO need to be flanked with other measures that provide incentives for user reaction.

International efforts have been accompanied by schemes with differentiation reflecting emission standards in a number of European countries. The best known example is Sweden, where the introduction of environmentally differentiated fairway dues was followed by a wide introduction of environmentally differentiated charges in ports (see Deliverable 6.1 for details).

The introduction of measures to reduce emissions from shipping has been addressed from the regulatory and the pricing perspective. One challenge in shipping is that emissions are related to the travelled distance of a ship and in the majority of the seas ships are not charged for using the water. Exceptions are in port access, canals (e.g. Kiel Canal) and fairways (e.g. Sweden). Reduction of emissions is in principal a global matter especially, if it is aimed at reducing emissions of a globalised industry such as the shipping sector. From a regulatory perspective, the International Maritime Organization (IMO) has been treating these issues at a global level. The last meeting of the Marine Environment Protection Committee (MEPC57) in April 2008 has unanimously agreed on a new model to reduce shipping emission ($NO_x$ and SO2). The new plan can be seen as an important step towards a global solution and potentially mitigates isolated national approaches. The implementation of emission reducing measures is thus moved to the flag states of the ships.[9]

This regulatory approach and advancement is important towards reaching more environmentally sound shipping activities. Furthermore, this global approach gives orientation for the implementation

[8] For further discussion see also Krause 2006

[9] For details see IMO MEPC57 meeting results and Schiff und Hafen (2008): Neue Standards für Schiffsemissionen. No. 5 May 2008, pp 28-29

of environmentally differentiated charges in ports and fairways and the evolution patterns over a longer time period. In this context, differentiation of port charges and fairway dues in relation to $NO_x$ and $SO_2$ emissions can be seen as economic instruments to provide incentives for the application of these set global aims. However, it should be kept in mind that isolated solutions, at national or at port level, might not lead towards the implementation of emission reducing measures, but to a geographical shifting of activities; so an application in a wider geographical context seems advisable. The author is of the opinion that environmentally differentiated charges can only be effective and fair, if the following framework conditions are observed:

- European wide introduction of a scheme.
- A system that deals with emissions based on the actual volume of the transported cargo and distance travelled and that applies similar charges to the other transport modes to create a level playing field. This is especially important for SSS operations, which is in direct competition with the other modes.
- An objective body that collects charges and is responsible for the sound spending of revenue. Ideally in programmes that underscore the implementation of technical measures to reduce emissions.
- A charging system that is revenue neutral and evolves with technical progress and in such way delivers towards effective and efficient charging.
- A system that does not base the charging on ports and which is non-negotiable and completely transparent.
- The level of charges should be related to the quantity of pollutants emitted and be set so that it is financially beneficial for ship owners to switch to low-sulphur fuel and invest in technology to considerably reduce $NO_x$ emissions from those vessels that regularly frequent the area.
- The quality of the fuel should not only be measured by the level of $SO_2$ and $NO_x$ emissions[10], but also related to particulates. A discussion should also be led to bring shipping lines to use higher quality derivates.
- Inland shipping should be included in the approach. Inland barges usually run on gas oil with a low content of sulphur (in the EU limited to 0.2 per cent). However, emissions of $NO_x$ are high and could be reduced by SCR or HAM techniques. [11]
- Discussions on market based measures for CO2 emissions in the shipping sector have mentioned differentiation as a possible option, but Shipping CO2 emission trading schemes (ETS) seem the potentially more effective tool, because a higher level than the local port authority seems to more adequate for implementing such schemes.
- The Swedish approach could be used as a benchmark, but national approaches are not the most cost effective and will affect shipping markets differently.

The infrastructure costs of shipping are related to fairways and ports. However, not all countries do charge ship owners for costs related to investment in and maintenance of fairways. National fairway dues exist in Estonia, Finland, Latvia, Norway and Sweden, but the degree of cost recovery differs greatly among them, being the highest in Sweden. Elements of fairway charging exist in the harbour due systems of Lithuania, Russia and the UK. Denmark, Germany, Poland and the Netherlands do not, in principle, charge sea vessels for the costs of providing and maintaining fairways.

The system for harbour dues differs greatly between countries and sometimes even among ports in the same country. Growing competition between ports, as well as ship owners, has resulted in an unwillingness to share real prices with third parties. This lack of transparency is an obstacle to environmental differentiation.

[10] $CO_2$ emissions are discussed within the application of ETS schemes and how to integrate shipping in such schemes.

[11] Economic instruments for reducing emissions from sea transport by Per Kågeson. The report can be downloaded in full (in pdf format) from the website of T&E or the Swedish NGO Secretariat on Acid Rain.

The approach to reduce environmental impacts of shipping needs to be driven in a cooperative manner. Therefore approaches such as the tripartite agreement between main stakeholders in the Sweden for environmental differentiated fairway dues are the way forward. Regulation and compliance with regulation can only be achieved in public–private sector cooperation. In the past, the shipping industry has shown willingness to improve their environmental performance. Introduction and differentiation of fairway dues at a European level could be part of the strategy towards environmentally sound shipping, which drive change.

## 4.6 DIFFERENTIATION IN PASSENGER TRANSPORT

Differentiation schemes in passenger services follow a different pattern. Napier University's Transport Research Institute ran an online survey parallel to the Hovercraft trial across the Forth in Scotland asking people about their perception of the service, their preferred travel options and their preferred pricing scheme for such a service.[12] The ferry passenger survey revealed:

- Users are looking for reliability and easy memorable schedules.
- Integration with other transport modes, in terms of interchange and ticketing, is a key factor.
- Users are willing to pay premium prices for high quality services.
- Users are looking for differentiated pricing schemes that serve their individual needs.
- Parking facilities are a key factor in the decision to use a ferry service.

Users expressed the need for integrated ticketing. Respondents in the survey saw integrated ticketing as a key factor to attractiveness of a transport service. Integrated ticketing for them also included the wish for parking charges to be either free or part of the fare. These findings revealed that parking might as well be an important part of infrastructure charging and that differentiated charging for parking can create significant user responses in terms of attractiveness and thus usage of a transport service.

Results showed that frequency, speed and quality are main drivers for commuters and tourists to use the by-sea transport option. Analysis of the operations also showed the positive environmental performance of the hovercraft in comparison to car and rail travel. Users also stated that there is a clear need to integrate transport pricing between different modes, which underlines the argument to move away from unimodal thinking patterns and shift towards integrated travel. The survey also showed that users wish for innovation.

Ferry services play an integral role in many city regions, where they are integrated as part of the local and regional public transport system. It has been found that the integration of ferries in intermodal passenger transport chains in terms of ticketing integration has been recognised as key in ferry transport as part of a public transport scheme. In cases such as Hamburg, the transport mode a user chooses does not matter in terms of price differentiation. The costs of operation and use of port infrastructure are weighted against the participation of the ferry services in the overall public transport network in terms of reach, frequency and number of people transported. Potential revenue gaps are covered by the public sector operator.

Differentiation for the user is embedded in the overall goals and strategy of the local transport authority. In the case of Hamburg, the overall strategy is defined by seamless transportation and to maximise the percentage of people using time and seasonal tickets (For details see Deliverable 10.2).

[12] The results presented are based on 291 completed online questionnaires received over a 3 week period.

# 5 DIFFERENTIATION - A QUESTION OF RESPONSIVENESS IN A GLOBALISED INDUSTRY

Shipping is a globalised industry and is currently functioning and competitive. In recent years it has been aimed at reducing the public sector involvement in ports and a main direction has been the implementation of private sector principles in ports especially port authorities. This devolution process has increased the determination of port authorities to make profits and to be efficient. In this devolution process different solutions and systems have been implemented, which are adjusted to the institutional structures and environment of each port. The differences also reflect the wide range of shipping markets.

Port infrastructure charges in most cases are negotiable and are obtained under market and strategic decision making processes and as such the appropriateness of government intervention in such a way as externally inducing charging schemes has to be questioned. A general EU approach for all ports to introduce comparable charging schemes seems somewhat artificial:

- An EU wide approach for differentiation criteria would have to take into account all different shipping markets and regional settings, such as geography, institutional set ups etc.
- The introduction of EU wide differentiation criteria might conflict with the adaptability of the scheme to market developments or changes. Thus, a reduced effectiveness would reduce the efficiency of the implemented schemes.
- The port authorities which function as businesses are functioning quite efficiently; therefore it is important to take costs of both ports and seaway's into account. Especially the handling of access fairways to an organisation is an issue here.

The competition between ports in a transport system is important for the maritime sector. The maritime sector consists of port to port navigation and the use of the ports. The maritime sector is part of a logistic chain of door-to-door transportation. Introduction of pricing in order to create a level playing field will create benefits for the maritime sector.

Even though competition of ports over equal hinterland and foreland is strong, ports also cooperate in certain fields. This concept of coopetition[13] can for example be observed in areas like schooling and capacity building.

In the discussion of the effectiveness and efficiency of differentiation, it should be kept in mind that the port is an interface, which usually connects to transport legs either on the maritime side or between land and water. Since a number of transport modes are usually connected, intermodality and differentiation concepts beyond unimodal thinking seem a potentially more effective approach. However, a number of behavioural issues play a significant role in this concept (for discussion see also Deliverables 10.1 and 10.2 of the DIFFERENT project). Research in this area needs to be widened to fully understand the decision-making processes; otherwise the effectiveness and efficiency of differentiation schemes might be reduced.

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(COOPEration compeTITION) Cooperation between competing companies. In the information field, coopetition means settling on standards and then developing products that compete with each other using those standards.

# 6 SUMMARY OF RECOMMENDATIONS

## 6.1 GENERAL SETTING

Differentiation of port infrastructure charges has to be seen in relation to market developments. Any differentiation scheme needs to include an evolutionary set up, which allows the effective implementation of adjustments in order to maintain the efficiency of the differentiation scheme.

Port infrastructure charges are only one part of overall port costs and, as demonstrated, do not necessarily create user responses. Thus the overall effectiveness of a differentiation scheme as a stand alone economic tool needs to be evaluated. In relation to strategic pricing and differentiation schemes motivated in this direction the following questions need to be raised:

- Is the port the most effective level to reach a strategy's goals?
- What is the role of differentiation of port infrastructure charges in the overall strategy?
- Are other (accompanying) measures in place to strengthen the anticipated behavioural response?

Port devolution has led to a wider spread of port authorities operating under private sector principles (e.g. Port of Hamburg, Port of Amsterdam). In this setting, the implementation of a differentiation scheme that is driven by political interest, either national or at European level, can only be realised, if revenue neutrality can be guaranteed for the charging body.

The differences between long-term and short-term needs have to be taken into account. Normally, only short-run effects and reaction are being considered but certain aspects have an influence in the long-run, which are not measured in the short-run. The level playing field of introduction is a very important issue and needs to be discussed further. The efficient use of capacity of ports needs more elaboration.

In the port sector, strategic port charge differentiation schemes underlie a lifecycle development. For example, the differentiation of port dues to attract higher standard ships using the compliance with the green award as the measure of differentiation makes sense during the start up and expansion phase of this scheme. However, as soon as the scheme comes into maturity, the differentiation effects are declining and the strategic incentive looses its importance. This is for example the case in Sullom Voe, where the differentiation is no longer applied, because all ships fulfil the differentiation criteria of segregated ballast water tanks.

A main problem identified, however, is how to use the revenues or recover costs which are produced by the differentiation scheme. This is only relevant when it comes to externally induced differentiation schemes.

## 6.2 STRATEGIC DIFFERENTIATION

Differentiation can be used to mitigate certain risks (e.g. environmental risks) by charging more to ships that pose higher risks to a port, such as tankers. If differentiation is used to mitigate risk, the following needs to be kept in mind:

- By charging higher port dues to a specific ship group, the respective shipping operator can react in two ways: by reallocating their services to other ports, which does not reduce the overall risk; or by replacing the current ship with a ship with higher quality standards and in return a lower risk level. Under a holistic approach, the former is not a desirable option, because it just shifts risk geographically and does not reduce the risk at all. Therefore, the elasticity of the user to higher charges and the potential reaction is important to take into account. Furthermore, such differentiation is a discriminatory approach and should be accompanied by incentives to influence the user towards reducing the overall risk level, in this case the introduction of a higher standard ship, to make it effective.

- Differentiation to mitigate risks (e.g. oil spills) should not be introduced in a single port, but in a wider geographical area context, in order to avoid the mere reallocation and, thus, the geographical shift of the risk. Even in a competitive environment, mitigation of risks should be dealt with in cooperative manner and in a joint effort of the ports in a specific region. In this case it seems advantageous to have an objective mediating body or organisation that drives such an approach.

## 6.3 DIFFERENTIATION TO MAINTAIN COMPETITIVENESS

Competitiveness between ports has been increasing throughout the European Union. Competitiveness can be a driver of differentiation schemes. Differentiation allows targeting specific markets and differentiating the port product of one port from other's. In a competitive environment a specific differentiation scheme can create market advantages and attractiveness to specific user groups.

Decisions in relation to competitiveness are single port (port authority) decisions, which are related to the overall strategy of the port, and if a port (port authority) operates under private sector market principles, it is the sole responsibility of that body.

## 6.4 EMERGING RECOMMENDATIONS

The following recommendations on the efficiency of and user reaction to price differentiation emerge.

The system boundaries need to be rational and consistent for services and port systems. Wide system limits will increase complexity and costs of the implementation of a specific scheme, but might be the only possibility to mitigate geographic shift of target groups e.g. the shift of environmentally substandard ships to other world regions. This also refers to the local port nor the European Union not necessarily being the most effective level of implementation.

Ships are operating in services in different trades. Differentiation in ports has been leaning towards granting ships operating in regional traffics and with higher frequencies attractive charging schemes. The question arises, if these differentiation schemes have contributed to the recent growth in European waterborne trade. These schemes can also be perceived as part of the incentives to shift traffic from road to sea. The existing differentiation of traffics has definitely evolved from a combination of shipping sectors demands and public sector policy strategy and as such has been a response to market requirements. The relatively wide spread of this differentiation scheme throughout European ports and the absence of such differentiation in port charging schemes in other regions hints towards a certain efficiency of this measure.

The aim of any new differentiation scheme or alteration of an existing scheme needs to be clearly defined.

- Will it be a policy tool for aiming at specific policy goals (e.g. environmental issues)?
- Will it be used for fair pricing between shipping sectors and other modes (i.e. all modes should pay their costs including external costs)?
- Will it be part of a ports strategy to maximize revenues or to increase competitiveness?
- Is the seaway or the port the focus for the differentiation scheme?
- Is differentiation of charging in the port?
- Is differentiation of charging in fairway the best solution?
- Is the geographical scope adequate to create the expected user response?
- Is the geographical reach adequate to reach the anticipated goals?
- Any differentiation scheme needs to be measured and weighted against alternative options, such as auctions and trading schemes (e.g. emissions trading).

The possible improvements or advances by implementing or altering a charging scheme need to be identified:

- Does the implemented or altered scheme contribute to the transparency of port infrastructure charges?
- Does the implemented or altered scheme lead to greater competitiveness of a port?

Existent Institutional arrangements need to be taken into account when discussing new differentiation schemes or altering existing ones. Impacts of different institutional arrangements regarding revenue creation and spending need to be better reflected. Potential conflicts of aims between revenue neutral differentiation schemes and competitiveness need to be mitigated. The differentiation scheme needs to be in balance with regulatory efforts or internal strategy of a port (port authority). If public intervention is needed to make a differentiation scheme economically viable, solutions need to found to prevent market distortion be prevented especially in regions with competing ports (e.g. North Range).

The feedback effects and complementarities between regulatory efforts and the differentiation scheme need to be clear and potentially mitigated. Instruments to monitor the efficiency and effectiveness of a differentiation scheme over time need to be in place. A differentiation scheme needs to foresee a lifecycle approach in order to maintain the effectiveness and efficiency of a scheme.

The experience has clearly shown that differentiation of pricing should not be relied upon as a single instrument. In understanding that differentiation underlies a life cycle regarding its effectiveness it needs to be assured that the institutional structure is sufficiently effective to react to market and framework changes and has the capability to adjust the differentiation scheme.

Differentiation schemes should be embedded in a wider policy and geographic context, if used as strategic externally imposed measures to the port community. Schemes like the environmental differentiation of port fairway and port dues worked in Sweden, but have not spread to a wider geographic area. The institutional set ups are different in countries throughout Europe and as such potentially prevent similar approaches, especially since the Swedish model drew heavily on subsidies given for implementation of emissions abatement. If differentiation schemes are imposed on ports externally in order to reach policy goals (e.g. emissions reduction) they need to be implemented in such a manner that competition is not distorted. Ideally such differentiation schemes can be developed that they underscore coopetition between ports.

Differentiation schemes have been successful, when developed in cooperation with the industry and relevant stakeholders. The cooperative approach between the different stakeholder groups should be enhanced to create wide acceptance of schemes.

Even if some differentiation schemes can be questioned in their efficiency in general they contribute to greater awareness of a problem or challenge. The discussion over environmental differentiation and the implementation in Sweden has definitely contributed to the greater awareness of environmental issues in the shipping sector.

Finally, user reaction in the shipping sector, for example to comply with specific quality standards in order to reduce external costs of shipping, depends on the estimation of costs of compliance or no compliance. Shipping operators work in long term investment cycles. As such differentiation of infrastructure charges at port level can be an attractive tool, if it is backed up by a set deadline at global level, which defines the obligatory implementation. Differentiation in this context will not directly lead to ad hoc reaction, but can potentially be an incentive to implement quality standards at an earlier point in time.

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