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Quality Shipping – Incentives, Disincentives

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Abstract

Shipping is the indispensable means of distributing goods between places of production and areas of consumption on our globe and is often claimed to be the most environmentally friendly mode of transport. However, there is a distinguished backwardness of shipping technology in environmental terms due to the hard competition within the globalised shipping business.

This article categorises impacts from ships on the environment from operational sources, by ship accidents and by the use of limited resources. It recognises the effort made by the IMO and other organisations in regulating ship operations and preventing accidents. However, there is widespread local or regional discontent in communities ashore concerning these mandatory regulations or the circumstances of their implementation.

This discontent has initiated various regional incentive systems, which are intended to cause ship operators to meet safety or environmental requirements that exceed mandatory regulations and grant a commercial benefit to those operators who comply. The article presumes that all of these incentive systems for "quality shipping" suffer from the unsolved question of how to finance the commercial rewards in a manner that fits into a competitive economy.

It appears that incentive systems will never become stable and long term establishments that can exist parallel to statutory regulations. The conclusion is, however, that we need these incentive systems as tools for testing new developments in the never-ending process of adapting our civilisation to the limited resources of our planet earth.

Key words: impacts on the environment from ship operation, impacts from ship accidents, sustainable use of resources, incentive systems, bonuses, quality shipping

1 Introduction

Today's global civilisation is characterised by the production and consumption of goods of all kinds on a high turnover level, a level that was developed and achieved during the 20th century by applying the principle of division of labour. This principle is that goods and services are produced in places of the globe where specific conditions are favourable, either by the availability of raw material or cheap labour, or by the existence of special technologies. The market is global as well, with an urgent need to exchange goods on a global scale.

Transport is the indispensable means of providing the link between production and consumption. The role of transport has increased considerably during the past 50 years and must now be regarded as equivalent to production, although not many people would perceive it as such.

More than 90% of the world's transport in tonnage is furnished by the shipping industry. There is no doubt, globalisation of production and marketing would not have developed that fast without a reliable shipping industry.

Shipping, while not the fastest is by far the most efficient means of transport compared with its main competitors rail, road and air, if applying the yardstick of fuel consumption per tonne multiplied by nautical mile. Shipping is therefore often claimed as the most environmentally friendly way of transport. However, it is just the scale effect (ships are large) and the low friction of the fluid medium water that produces the beneficial relationship of fuel consumption to units of transport work.

In fact, unlike road or rail traffic, shipping takes place beyond the horizon of (ordinary) people most of the time. The sea is large as is the sky, and competition between shipping operators has led to a distinguished backwardness of shipping technology in environmental terms. Technical solutions for the prevention of pollution and the careful use of resources that are common practice ashore, face difficulties in being implemented in ships. The reasons are less of a technical nature than the fear of commercial drawbacks within the globalised shipping business.

Certainly, immense progress has been made within the last five decades of IMO activities by creating regulations for ship building, safe ship operation and pollution prevention. But still, from time to time, public attention is drawn to disasters at sea with tremendous impacts on the environment, while at the same time the permanent strain on marine resources from normal ship operations is hardly perceived.

Gladly, there are people who know about these conditions and who try to improve the performance of ships in order to keep pace with technology ashore. "Quality shipping" appears to be a new key concept, and the question is, how to attract ship operators to apply advanced technologies or place a well-motivated crew on board.

Such moves are by no means restricted to shipping. Farming, an ultimate and essential activity with regard to the survival of the human race, faces similar challenges in many countries. How can farmers be attracted to produce their products in a more sustainable manner and avoid the profitable misuse of insecticides, herbicides and fertilisers under the competitive pressure of a global market? Thus, shipping is only one of the many battlefields where sustainability and profitability come into collision and where any progress is the result of determination and minute steps.

2 Potential of quality shipping

The term "quality shipping", although frequently used by authors for specific purposes and recently introduced as a synonym for a distinguished bonus system model[1] (see chapter 4), is the most suitable term to describe the potential of improvements and at the same time to create associations with economical benefits for operators and their customers. This may be less so with terms condensing their aims simply to associations with the colour "green". Quality shipping should be the goal that combines the aims of safety, environment protection, sustainability and economy. Now, where are the threats from and within shipping that are to be looked at?

- Shipping affects the environment in various sensitive areas by two distinguishable mechanisms, i.e. through normal operation and through accidents.
- Ship accidents have, apart from the environmental impact, the secondary effect of also posing a direct threat on the health and life of humans and causing the damage to and loss of property.
- A third and less perceived aspect of quality shipping should be the careful use of natural resources like fuel, as well as the conditions of building and re-cycling ships.

The outline of threats and potential countermeasures[2] in Table 1 is intended to provide the reader with an overview that is kept systematic while highlighting the acute problems.

The most obvious operational impacts, i.e. direct pollution of the sea by ships' waste materials, in particular by oily residues from engine room bilge's and by cargo residues, have been well regulated within the past decades by international legislation. Unfortunately, they continue to cause problems and the results of disobedience can be monitored on our beaches where oily birds and garbage line up at the high-water mark.

Only recently air pollution from ships became an issue of concern for international debate and legislation. Regional interest has resulted in national incentives and control in certain port areas that exceeds the international compromise.

The same applies to poisoning of the sea by anti-fouling systems, where the coming ban of tributyl-tin compounds has triggered a search for ecologically compatible alternatives that last the desired 5-year docking period of large ships.

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1 GAUSS, ISL: *Entwicklung eines Modells für ein integratives und international einsetzbares Bonussystem*. In: *Quality Shipping*. January, 2002.

2 Harbrecht, J.P.: *Entwicklung eines Kriterienkatalogs für die Vergabe des Prädikates "Umweltfreundliches Schiff"*. Bremen: GAUSS, 1998.

Table 1: Overview on threats and counter-measures

No.	Effects	Events or causes	Counter-measures
1.	**Operational impacts from ships**		
1.1	Discharge of waste material into the sea	.1 Garbage .2 Sewage .3 Slops and sludge from engine .4 Cargo residues (liquid, solid)	Shore reception, incineration Shore reception, biochemical treatment Shore reception, incineration Shore reception, legal discharge
1.2	Pollution of the air	.1 Flue gases from ships' engines .2 Gases and vapours from cargo .3 Halogenated hydrocarbons	Clean fuel, treatment of flue gases Vapour return to shore, condensation Replacement by harmless gasses
1.3	Poisoning of the sea	.1 Anti-fouling systems .2 Anti-corrosion anodes	Replacement by harmless material Replacement by harmless material
1.4	Impacts to sea mammals	.1 Under-water noise .2 "Ramboing" (collision, cutting)	More research required Warning signals, research required
1.5	Impacts to distant regions	.1 Transport of aquatic species .2 Transport of vermin .3 Transport of diseases	Ballast water management, treatment Disinfection Improved health control
1.6	Impacts to ship personnel	.1 Noise from machinery .2 Vibration from propulsion .3 Fatigue .4 Isolation	Isolation, alternative design Design of hull and accommodation Increase of manning, rest hours Reduction of contract duration
2.	**Impacts from ship accidents**		
2.1	Navigational accidents	.1 Collision .2 Grounding	Improved training, reduced fatigue Improved training, reduced fatigue
2.2	Heavy weather damage	.1 Structural damage to hull .2 Damage to or loss of cargo .3 Leakage, sinking	Improved ship design and ship handling Improved cargo stowage and securing Improved ship design and ship handling
2.3	Stability accidents	.1 Capsizing .2 Heavy list from shift of cargo	Improved stability management Improved cargo stowage and securing
2.4	Structural failure of hull	.1 Wrong loading/unloading .2 Corrosion	Improved control of loading/unloading Improved inspection and maintenance
2.5	Fire, explosion	.1 Combustible material .2 Sources of ignition	Improved design and operation Improved design and operation
2.6	Engine failure	.1 Poor design and lay-out .2 Poor operation and maintenance	Improved design and lay-out Improved operation and maintenance
2.7	External violence	.1 Terrorist attack .2 Pirate attack	Specific security measures Specific security measures
2.8	Personnel accidents	.1 Mechanical accidents .2 Technical accidents .3 Chemical accidents	Improved work procedures, protection Improved technology, training Improved training, protection
2.9	Commercial loss or damage	.1 Damage to cargo .2 Delay of services	Improved cargo handling and stowage Improved operational management
3.	**Sustainable use of resources**		
3.1	Fuel consumption	.1 Use of small ships .2 Use of fast ships .3 Low propulsion efficiency .4 Avoidance of fossil fuel	Optimised ship size Optimised ship speed Optimised propulsion technology Alternative propulsion (wind, fuel cell)
3.2	Sustainable ship building	.1 Energy used for ship building .2 Environmental loads .3 Commercial balance	Research required Research required Avoidance of tonnage surplus
3.3	Ship recycling	.1 Poor efficiency of recycling .2 Environmental loads	Research required Research required

Impacts on sea-mammals is still a widely unexplored field, but the phenomenon of whale stranding and the extrapolation of observed ramming to the number of unknown hits indicate the necessity of research and reaction. This may include fishing technology.

Impacts on distant regions apply to trans-ocean shipping only, but must be considered as a serious threat that is not limited to the transfer of aquatic organisms in ballast water. Appropriate measures have been introduced, but their effects are still under evaluation.

The operational impact of shipping to ships' personnel is a permanent source of discussion and has led to international regulations with regard to, e.g. rest hours. However, the effect of these regulations in daily practice appears to be poor. The outstanding importance of this sub-category is its direct influence on the main category of accidental impacts. A tired and de-motivated crew will certainly contribute in raising the probability and severity of accidents.

The extent of operational impacts from shipping depends largely on the type and size of ships. The degree of disobedience of protective regulations reflects not only the quality of the crew but also the commercial pressure exerted from ship operators ashore. The importance of distinguished protective measures is not an absolute figure but depends on traffic density, on the local regeneration potential of marine resources and on regional or local political interest. These relativities may be partly responsible for the low level of the present international environmental protection regulations.

Impacts from ship accidents are well known through the publicity of associated oil pollution following nearly all accidents of the major sub-categories 2.1 to 2.5, which nevertheless include severe economical damage and losses in the first place.

The sub-categories 2.6 to 2.9 address damages and losses with less public concern, but with substantial economical consequences as well.

Prevention of all these accidents is the principal endeavour of all the players and is manifested by appropriate legislation, ship design and equipment and by the regulated training of seafarers. The safety record of shipping is not too bad at all, but improvements are advisable, in particular with regard to the "human factor" involved, as indicated by the key word "improvement" in the right column for nearly all sub-categories of the accidents in Table 1.

The third category of aspects associated with quality shipping, the sustainable use of resources, is still in an initial stage of development and perception. The main ship building material, iron, is obviously not at its limits on earth. The concern about limited resources is rather directed at fossil energy from coal, oil and natural gas that is used to produce steel from iron ore in order to manufacture ships and, furthermore, to drive them.

The scale effect of specific fuel consumption has inevitably led to large container ships, huge tankers and bulk carriers with surprisingly low fuel demand per tonne and mile. However, at the same time the development of fast and super fast ships[3] is being pushed ahead in order to satisfy the demand of short-term delivery of goods and services. Political economics is required to optimise ship size and ship speed with a view to saving fuel, while at the same time improved propulsion or alternative power supplies should be developed.

The commercial balance between tonnage demand and available tonnage is not only beneficial to the sustainable use of resources but will also guarantee freight rates that facilitate the observation of legal requirements directed to avoid the operational impacts of shipping and ship accidents.

3 Statutory requirements

Not all categories and sub-categories of threats shown in Table 1 have been addressed by international conventions and the associated mandatory codes of conduct, but the important ones certainly are. Most of these legal instruments have been issued by the IMO during the last five decades in a reactive manner rather than in a pro-active approach. This is excusable since an accident is the best proof of the necessity of regulating action. Nevertheless, the regulations are then intended to prevent operational impacts and accidents and they are to be enforced by flag states and port states[4].

Considering that agreements among all the member states of IMO are usually achieved as compromises with unanimous acceptability, i.e. usually on a low level, it is questionable whether compliance with all the statutory requirements alone may already entitle a ship or a company to claim that "quality shipping" is being offered.

Furthermore, there are non-mandatory codes, resolutions and circulars available with the characteristics of guidelines, which may only have a legal consequence after an incident has happened, where disobedience of these guidelines can be judged as a lack of good seamanship or violence against technical standards and punished on behalf of ordinary criminal law. Voluntary observance of these guidelines and other standards, exceeding mandatory regulations, is doubtless the better criterion for granting the award of "quality shipping".

The SOLAS Convention certainly ranks highest among all relevant legal instruments and addresses vital aspects of ship design and equipment as well as navigation. These aspects concern the following sub-categories in Table 1:

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3 Isensee, J. e.a.: *Environmental Impacts of Fast Ships*. Contribution to HIPER-Conference, March 1999.

4 ICS: *Shipping and the Environment: a Code of Practice*. 3rd edition. London: Marisec Publications, 1999.

- 2.1 Navigational accidents (supported by the mandatory Collision Avoidance Rules),
- 2.2 Heavy weather damage,
- 2.3 Stability accidents,
- 2.4 Structural failure of hull,
- 2.5 Fire and explosion,
- 2.6 Engine / machinery failure,
- 2.7 External violence,

and to some extent also

- 2.8 Personnel accidents.

The SOLAS Convention, moreover, features the mandatory ISM-Code, which has the notable potential of really implementing all mandatory regulations.

The MARPOL Convention is the next important and deals with two sub-categories in Table 1:

- 1.1 Discharge of waste material into the sea, including harmful cargo residues,
- 1.2 Pollution of the air.

Annex 1 to this convention also regulates the design aspects of oil tankers with the aim of minimising oil pollution after an accident.

The STCW Convention regulates the mandatory training, certification and watch-keeping of seafarers and is therefore directed to the "human element" that is involved in nearly all sub-categories of accidental impacts and in the operational discharges in Table 1. The STCW-Code also addresses rest hours in its mandatory part A, which is intended to reduce the fatigue effects on seafarers.

There are, in fact, further conventions and mandatory codes in place for regulating the distinguished aspects of safe shipping addressed in Table 1, e.g. the International Convention on Load Lines.

Four important sub-categories in Table 1 are presently "under way" to being controlled by mandatory regulations. These are:

- 1.2.1 Flue gases from ships' engines,
- 1.3.1 Anti-fouling systems,
- 1.5.1 Transport of aquatic species,
- 2.7.1 Ship and port security.

The new Annex VI to the MARPOL Convention, addressing air pollution and thus controlling harmful flue gases, will come into force as soon as the necessary number of

member states with the required tonnage have ratified it. The same applies to the Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS Convention).

The control and management of ships' ballast water to minimise the transfer of harmful aquatic organisms and pathogens is under intense discussion and appropriate guidelines have been issued. A conference at IMO in 2003 decided to establish an independent convention on this matter in 2004.

It appears that an early and voluntary compliance with one or more of these four regulating issues would be a typical criterion for an owner or operator to be awarded the title of "quality shipping", although this would only have a temporary effect until compliance has become mandatory.

4 Initiatives on quality shipping

Considering the compromise based level of mandatory legal instruments for improved performance of shipping, the incorporated "grandfather clauses" and the slow mechanism of entry into force, the discussions and moves to achieve earlier and better solutions on a local or regional scale are understandable. The main obstacle to local or regional solutions for "quality shipping" are the possible economical drawbacks of that place or region, because shipping usually reacts quite flexibly in choosing the most convenient place of business as long as there is a choice. This is particularly the case in Europe where different national interests share the same region.

Quality shipping causes an extra cost for the ship operator, but creates a benefit to society, which is manifested politically as local or regional interest. Thus, the principle of an incentive for quality shipping should be expressed by the simple equation:

effort of ship operator on quality shipping	=	**monetary advantage granted by local or regional interest**

Unfortunately, politicians have difficulties in convincing taxpayers to directly spend extra money on a cleaner environment and to gain the further benefits of quality shipping. Therefore, a commercial solution is often sought with the monetary advantage paid through a reduction in port dues or similar fees[5]. The commercial imbalance following this policy can be compensated by a gradual raising of the reference dues and thereby appropriately increasing dues for those ship operators who do not yet comply with the distinguished measures of quality shipping.

This is shown by the following example for a port granting a reduction in port dues for customers who comply with certain non-mandatory requirements. Figure 1 shows the increasing number of customers over a transition period of time, assuming the mandatory status of these requirements at the end of this period. Figure 2 shows the

[5] Institute of Shipping Economics and Logistics (ISL): *Ökonomische Anreizsysteme für umweltverträglichen Seeverkehr*. Bremen: ISL, 2000.

granted reduction in port dues causing an increasing loss of income of the port during the period and from then on a constant shortage (shaded area).

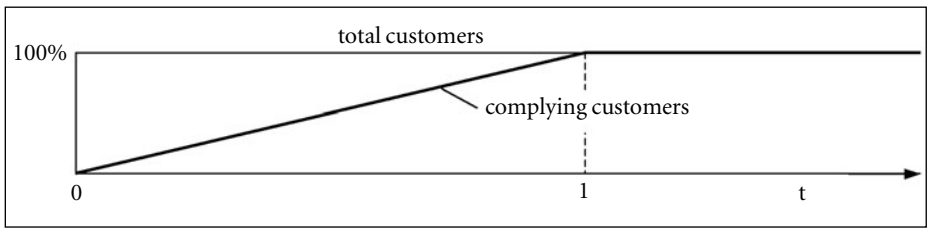

Figure 1: Complying customers in a quality shipping campaign

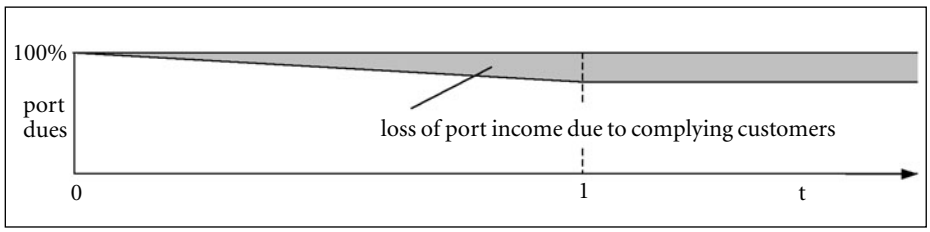

Figure 2: Loss of port income due to granted discount

Figure 3 shows this shortage fully compensated by increasing the dues in a way so that at the end of the transition period the same amount is collected as in the beginning of the period. By this measure the granted percentage for those who comply is gradually reduced while increasing dues are paid by those who do not yet comply. In this way a constant level of dues can be collected, at least theoretically, assuming all customers stay in business with that port.

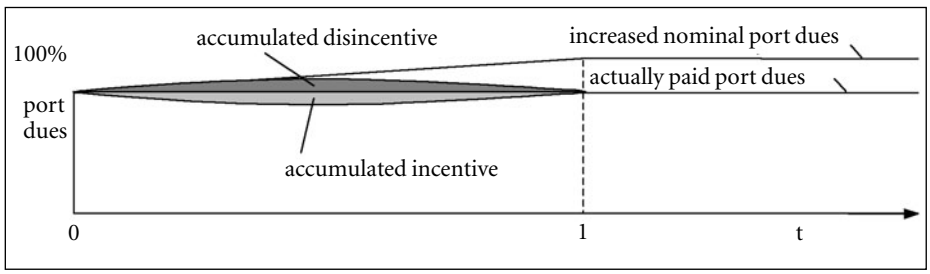

Figure 3: Compensation of loss of income by increasing nominal port dues

From a collective ship operators' point of view this is something like a "dirty trick", because they invest money, the one sooner, the other later, and at the end of the incentive/disincentive period they pay the same dues as before. But in reality it works. The ones who decide to invest early can really make a profit while the others will lose

money, unless they decide to divert to another port. The latter option describes the inherent risk for the port or region.

The following text describes some of the most prominent incentive systems, showing also the basic problems with their implementation.

4.1 Green Award

The Green Award Certification System[6] was developed in 1994 by the Green Award Foundation in Rotterdam. The Foundation consists of a Committee representing the international maritime industry including the public interest, a Board of Experts, a Board of Appeal and the Bureau Green Award (BGA) as the executive body.

The BGA is prepared to inspect and certify oil tankers of 20 ktdw and above on request of the owners. Certification is based on requirements laid down in checklists. The requirements include aspects of the management of the company and of the onboard management, as well as technical requirements with regard to the avoidance of operational pollution and control of accidental pollution. Some requirements exceed the mandatory regulations. Presently, about 200 ships are certified and the scope of the ships is recently said to include large bulk carriers.

The cost for the owners arises from fees for certification with yearly follow-up inspections, and the possible extra cost for attaining certifiable conditions, in particular for aged ships.

The benefit for the owners or charterers is granted by a reduction in port dues in the Port of Rotterdam and in a number of other ports in Europe and in South Africa, having joined the system. The reduction ranges at about 6%. Additionally, there are indirect benefits through discounts from underwriters and bonuses from charterers.

The Green Award Certification System is profitable for large ships, for new ships and for companies with a large number of ships. It is financially less attractive for small ships and for single ship owners. The certification and surveillance process is perceived as an additional burden of workload for the company and for the ships' staff. It remains unclear in which way the necessary income of ports is maintained under the aspect of granted discounts.

4.2 Swedish Incentive System of Differentiated Fairway and Port Dues

In 1996 a Three-Party-Agreement between the Swedish Maritime Administration and the interest of Swedish ship owners and Swedish port industries was arranged with the aim of reducing the emission of sulphur and nitrogen oxides in Swedish ports by 75% within a period of five years[7].

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6 Green Award Foundation: *Annual Report 2001*. Rotterdam: Green Award Foundation, 2001.

7 Swahn, H.: *Environmentally Differentiated Fairway Charge in Practice – the Swedish Experience*. Unpublished draft, May 2002.

In order to initiate the use of low sulphur fuel and specific measures to reduce NO_x emission in ships that frequently call at Swedish ports, a differentiated fairway and harbour dues scheme was created and offered to customers. The dues are calculated in a way that the cost for the total number of ships coming to Swedish ports remains constant.

Verification of the compliance with the requirements of SO_x and NO_x reduction is comparatively simple and achieved by a certificate issued by classification societies and laboratories accredited by the Swedish Maritime Administration. Additionally, on-board checks of the fuel actually burnt can be carried out at any time in a Swedish port.

More than 2000 vessels comply with these requirements, but the system is not profitable for ships that do not enter Swedish ports regularly. Nevertheless the approach is considered as a success and will be expanded to other countries in the Baltic region[8].

4.3 Norwegian Approach

In 1994 the "Norwegian Green Ship Research Programme" was initiated. It aimed at creating a global uniform incentive and control system that would possibly replace existing systems like the "Safety Point System" of the United States Coast Guard, the "OMS Screener" of the State of Washington, the "Green Award System" of Rotterdam and the "Green Bonus" in Australia. However, it soon appeared difficult for a uniform system to satisfy all the users such as ports, underwriters, workers' unions and ship operators[9].

The researchers developed a so-called "Environmental Indexing of Ships" that should be used for differentiating the international tariffs of dues and fees. The indexing system addressed all aspects of ship operations exceeding mandatory requirements in certain areas. Sustainable ship building and recycling was considered, but has not been included so far. Ships with the Index 5, the highest level, should be given a discount of 50% on all port and traffic related dues all over the world.

This initiative failed for mainly two reasons. One reason was that the implementation of the indexing system through IMO was not feasible because delegations had been struggling hard to achieve agreements on the mandatory issues and were not prepared to create another "upper class" system. The other reason was that the researchers did not present a solution for the financing of discounts granted to complying ship operators.

In 1997 Norway submitted a revised proposal to the MEPC 40 session that contained a Formal Safety Assessment directed at five different ship categories. The further

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8 NERA: *Evaluation of the Feasibility of Market-Based Instruments to Promote Low-Emission Shipping in European Union Sea Areas*. Discussion document, August 2003.

9 *Op. Cit.* 2.

development of the approach is somewhat uncertain. Meanwhile, Norway has introduced an environmentally differentiated tonnage tax and the Norwegian classification society DNV has initiated the International Marine Safety Rating System. The latter has the indirect benefit of raising the efficiency of an implemented Safety Management System required by the ISM-Code.

4.4 Bremen Quality Shipping

Compliance with article 26(2) of UNCLOS requires a new financial concept for public measures to improve safety of shipping and environmental protection in coastal waters. This would include a re-definition of the appropriate contribution from the shipping industry through fairway dues[10], providing an opportunity for "quality shipping" by granting reductions of these dues.

The definition of quality shipping in this context has to be perceived as a continuous process, due to legal and technological progress. A research project, sponsored by the German Federal Environmental Agency, was initiated in 2000 for developing dynamic criteria of quality shipping. Three years later, the first cargo vessel was awarded with the "Blue Angel Award" under the present criteria. The general scope of the criteria for the award is:

- appropriate company policy and management,
- advanced ship design and equipment,
- safe and environmentally friendly ship operation.

The latter includes at this time the avoidance of TBT-antifouling and other restrictions that are not yet regulated by mandatory instruments.

In 2001, the Free and Hanseatic City of Bremen initiated another similar research project[11] for the development of an internationally applicable incentive scheme for quality shipping with the following features that distinguish it from the early Norwegian approach:

- neutrality to port competition,
- minimal administrative effort,
- voluntary participation.

The project was finalised in 2002 and recommends granting differentiated bonuses on "Marine Environmental Protection and Safety Dues" (MEPS) rather than on port dues. In this way the competition problems of ports are avoided. Any residual imbalances can be covered by public funds, i.e. by the taxpayer. The system has not yet been implemented. A test run on a regional scale has been recommended.

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10 WBGU: *Entgelte für die Nutzung globaler Gemeinschaftsgüter*. In: *Politikpapier*. February, 2002.

11 *Op. Cit.* 1.

5 Summary and prospect

Although it is justified to consider shipping as the most efficient and therefore the most environmentally friendly way of transporting goods and people over great distances on our globe there is still considerable potential to improve the performance of ships, in particular concerning the avoidance of accidents and the sustainable uses of resources in general.

The most important aspects of environmentally friendly ship operations and accident prevention are covered by uniform mandatory regulations under the control of flag states and port states. Notwithstanding the fact that these control institutions are still struggling to attain obedience from all ship operators, there is a widespread local or regional discontent in communities ashore with the mandatory regulations themselves or the circumstances of their implementation.

This discontent is the source of temptations to require a higher standard for a port or a region, knowing that compliance with that higher standard needs investment on the side of ship operators. As there is no simple mechanism available that allows compensation for these extra costs by increased freight rates, ship operators will be inclined to avoid that port or region. Therefore another form of compensation is generally offered. This is called an incentive, which raises immediately the question of its financing. The answer near at hand is to install a simultaneous financial disincentive for those customers who do not (yet) comply with the higher standards.

It can be easily seen that this will lead to difficult situations in financial and competitive terms for both, port regions and their customers, so that local or regional incentive systems will never become stationary structures, nor can they be installed on a global scale. In most cases higher standards will be reached or even overtaken by mandatory requirements after a certain period of time. This proves that incentive systems must be dynamic in principle.

Thus, there is little left that speaks in favour of incentive systems in general. However, the experimental implementation of higher standards, e.g. low sulphur fuel combustion, biological sewage treatment or redundant propulsion systems, must be highly valued, because there is nothing that convinces decision makers as much as the practical demonstration of feasibility. It therefore seems advisable to promote and use incentive systems on "quality shipping" as a deliberate tool for developing and testing future legal requirements within the on-going process of adapting our technical development to the needs of preserving the limited resources of our planet earth.