

*North Sea Ministerial Meeting on Environmental Impacts of Shipping and Fisheries  
(Gothenburg, Sweden; 4-5 May 2006)*

**Background document on the Clean Ship Approach**

**Prepared by Norway and the Netherlands**

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## Chapter 1: Introduction to the Clean Ship Concept

In the **Bergen Declaration** (§ 48) the Ministers stated the following:

*“The Ministers acknowledge that new approaches and mechanisms are needed to minimize the impact of shipping on the environment, and agree:*

*i) to explore and develop the concept of vessels designed, constructed and operated in an integrated manner to eliminate harmful discharges and emissions throughout their working life (the 'Clean Ship' approach). This approach will address all vessel operations and possible impacts on the environment and consider amongst other strategies the use of recycling, waste prevention and closed-loop process. The first stage of this work, compiling a comprehensive specification of the parameters of the 'Clean Ship' and establishing a system for monitoring progress towards fulfilment of the concept, will be reported on by 2004;”.*

This paragraph defines the Clean Ship approach as to be:

*“...to explore and develop the concept of vessels designed, constructed and operated in an integrated manner to eliminate harmful discharges and emissions throughout their working life.”*

The concept addresses<sup>1</sup>:

- *Design of vessels*

A Clean Ship design includes the overall functioning of a vessel, for example it can include solutions such as cargo handling, efficient hull design and solutions which further reduces the probability of accidental spills. The Clean Ship concept is thus included in the very first planning phase of the vessel, providing a basis for sustainable shipping in its lifetime.

- *Construction of vessels*

The construction of a Clean Ship addresses materials used, and how the construction is undertaken. It can address dimensioning and quality of steel plates but also the quality and tolerance of construction work. The construction phase of the Clean Ship approach also includes choosing environmentally friendly products and equipment. Sound construction of the Clean Ship ensures better environmental performance, longer lifetime and increased safety.

- *Operation of vessels*

The understanding of this term relates to how the ship is operated during its service. It includes, amongst others, handling and use of chemicals on board. Cargo handling should ensure no environmental damage. Waste handling and safe navigation etc are also to be included under the Clean Ship operation. Operating under the Clean Ship concept also requires considering the logistical aspects of transport in general. Both the environmental awareness of the crew and the role of the ship's management are important in operating the Clean Ship.

- *Eliminate harmful discharges and emissions*

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<sup>1</sup> Text agreed at CONSSO, October 2003.

This term shall be understood as a long-term target to have eliminated any negative environmental impacts of shipping. The word harmful is not a definitive term as it is influenced by scientific knowledge and common understanding.

- *Throughout their working life*

The understanding of this term should include a cradle to grave perspective on shipping. As such the ship should also be designed, constructed and operated in a way that enables the ship to be recycled in a sustainable way.

Additionally the other subparagraphs of paragraph 48 provide additional elements that contribute to cleaner shipping:

*ii) to explore introducing economic or other incentives in order to improve the environmental performance of shipping, by rewarding quality ships and as far as possible harmonize such incentive schemes, and to promote this concept internationally, in particular within IMO, and include the establishment of global criteria for incentive schemes and other environmental differentiating schemes; and*

*iii) to initiating programmes to improve the environmental awareness of the maritime community, for example by introducing marine environment awareness courses.*

Paragraph 48.ii deals with exploring economic or other incentives towards increased environmental performance of shipping. Economic incentives are one of the means by which the Clean Ship approach can be stimulated. In addition paragraph 48.iii. deals with awareness, which in this background document will be shown to have an important influence on decision making in the maritime industry. In this document it can be said that paragraph 48 from the Bergen Declaration will be explored in its entirety.

#### Organisational context of the Clean Ship Approach.

The Clean Ship Approach first surfaced within the North Sea Ministerial Conferences in Esbjerg 1995. It was then further elaborated in Bergen 2002 towards the texts listed above. Within the North Sea Ministerial conferences political commitments and ideas are developed, but execution takes place nationally or in other forums. In the case of shipping the IMO is the global regulator for the industry and many of the concepts developed in this document may have to be taken up there. The political agreements arising from the next North Sea Ministerial Conference can guide work on shipping at IMO, within the EU and in the different North Sea States. Many activities proposed are non-legal in nature and can be implemented without the need for a global framework.

## Chapter 2: Understanding the phases in the Clean Ship Concept

### 2.1 Elements in a Clean Ship Concept

This chapter elaborates on the phases included in the Clean Ship approach in order to create an understanding of the options in each phase. Each phase, planning, designing, building, operating and recycling, contains several elements on which the Clean Ship approach can be built. Within each element there may be several options that may lead to actions towards cleaner shipping.

The list of options included in this document may be added on as needed. The choice is based on identifying whether the Clean Ship approach is followed in each step of the process, and should therefore not be overly elaborate.

The stages identified are (see figure 1):

#### - *The planning phase*

In this phase the ship owner is evaluating the transport concept including which segment he wishes to provide to his customer. Towards the Clean Ship concept, ship owners should evaluate the possibilities of choosing more innovative concepts for design and innovation. Environmental awareness should be strong part of the considerations of ship owners: a market segment should emerge for these ships. Consideration of cargo carrying capacity and vessel speed are included in this phase. Stakeholders that could be included are parties in the transport chain such as customers and cargo handlers, but also other important parties such as crew representatives etc.

#### - *The design phase*

Innovative concepts and environmental awareness should be transferred to the specifications and design of the ship to be built. The design can do this by taking into account the environmental performance and safety of all the ships elements. In addition, the design can choose to go further than set standards in ensuring a Clean Ship. In the design phase it may be beneficial to benefit from the experience of the ship's master to be and other parties that will have to work with the ship to safeguard successful execution of the ship's plan.

#### - *The construction phase*

The quality of the construction work determines to a certain extent the safety and durability of the ship. The environmental performance of the shipyard adds or subtracts to the environmental impact of the ship's building and operation. Sometimes changes are made by the yard relative to the ship's design to make construction easier. These changes should be used as feedback for next designs and should not lead to lower environmental performance.

#### - *The operation phase*

After being built and delivered, the ship will be operated. This operation should take into account the environmental performance of the ship. In its operation the ship owner can ensure best environmental performance by good maintenance and upgrading the ship when necessary. Measures of this environmental performance are emissions themselves, but also the measure in which the ship partakes in incentive schemes and compliance with legislation. Sound operation of the ship also includes preparing the ship for recycling or responsible resale. In the ship's operation again the ship's master, crew and the logistics chain could be involved in decisions regarding the operation of the ship. Through this vertical integration into the chain efficiencies of coordination may be obtained.

#### - *The reselling/recycling phase*

While still in operation, the ship should be made ready for recycling. In the case that the ship is resold, this should be done in a responsible manner. In effect the ship must comply to high

environmental standards, and the ship owner must be confident that the ship will be operated in a good way (as in the previous paragraph). Finally, the environmental performance of the recycling yard is of course important in the life cycle of the Clean Ship.

In the figure below (figure 1), the Environmental performance is the main link to monitoring. Aspects of planning, design, construction, operation and recycling can be contained in the Green Passport (see chapter 4).

## 2.2 Environmental parameters

Actions undertaken within each element of the Clean Ship Concept determines the total environmental performance of the ship. The environmental performance can be characterized by a set of environmental parameters. Actions can also be triggered on the basis of policies for reducing emissions/discharges of certain parameters.

The parameters can e.g. be grouped into:

1. Parameters controlled by a regulatory framework (e.g. IMO, EU, other):
2. Parameters not controlled by a regulatory framework but considered to be important to control.

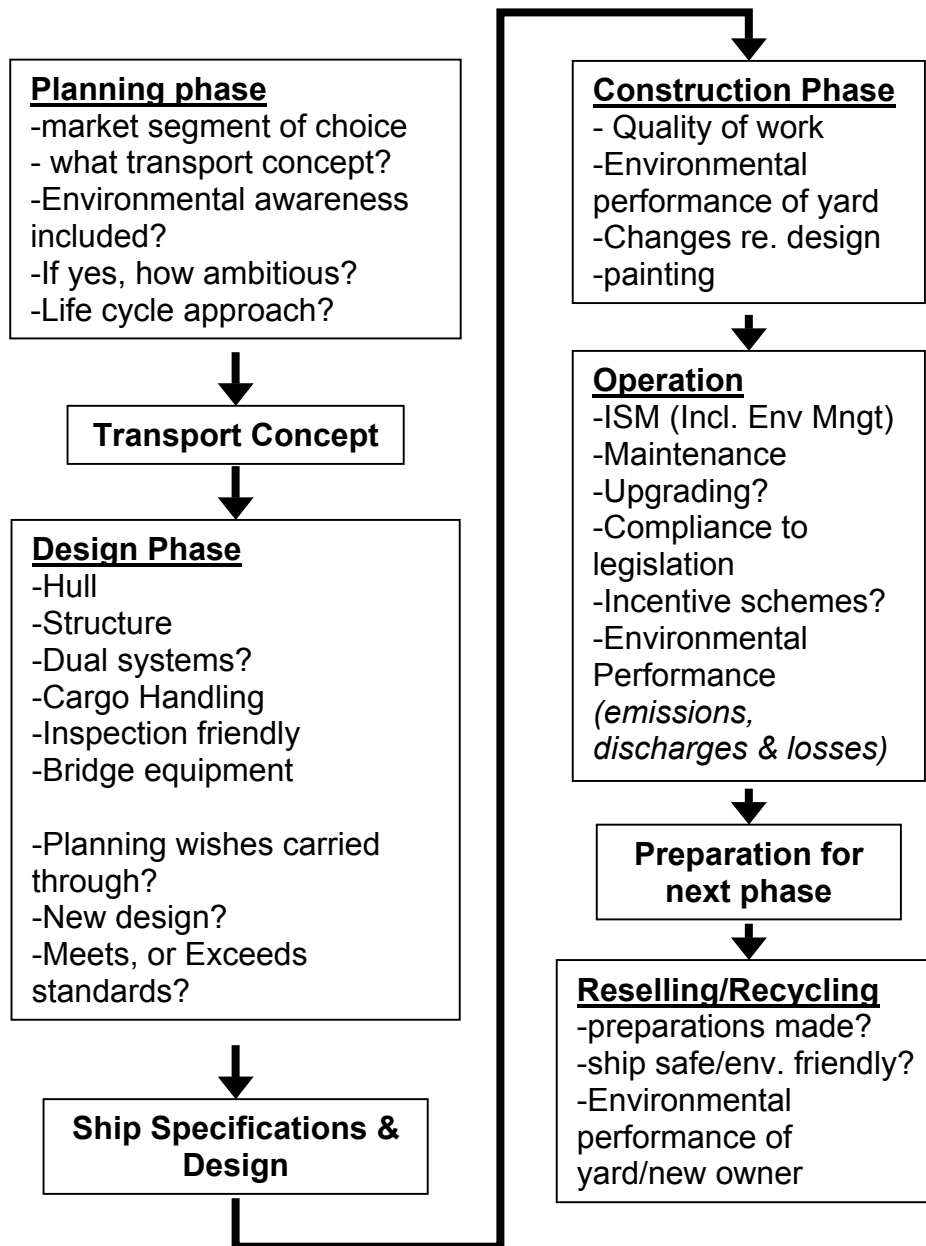
More specifically as set of the most important environmental parameters are given in table 1 below. In addition the single list of hazardous substances (as developed for the IMO ship recycling guidelines, MEPC 53/3/1) which may be found on an existing ship going for recycling should be used in preparing for minimizing or eliminating the use of such substances

Table. 1 Environmental parameters

<p><b><i>Emissions to air:</i></b>  <b>CO<sub>2</sub>,</b>  <b>NO<sub>x</sub>,</b>  <b>SO<sub>x</sub>,</b>  <b>PM<sub>10</sub>,</b>  <b>VOC,</b>  <b>PAH's,</b>  <b>Heavy Metals,</b>  <b>Ozone Depleting</b>  <b>Substances (Halons, CFC,</b>  <b>HCFC),</b>  <b>Fuel consumption &amp; fuel</b>  <b>quality,</b>  <b>Incinerator emissions</b></p>	<p><b><i>Discharges to water:</i></b>  <b>Oil,</b>  <b>Hazardous</b>  <b>substances/Chemicals(incl.</b>  <b>cleaning additives),</b>  <b>Garbage/Waste,</b>  <b>Sewage,</b>  <b>Ballast Water,</b>  <b>Biocides (e.g. AFS),</b>  <b>Other cargo residues (dry bulk,</b>  <b>fish waste),</b>  <b>Metals</b>  <b>Wastes and spillages during</b>  <b>cargo handling and bunkering</b></p>	<p><b><i>Accidents:</i></b>  <b>Cargo,</b>  <b>Ship</b></p> <p><b><i>Discharges to shore</i></b>  <b>Wastes produced,</b>  <b>Recycling impacts</b></p> <p><b><u>Other</u></b>  <b><u>Noise</u></b></p>
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## 2.3 Participation

Implementing the Clean Ship approach requires commitment and support from many different parties. In order to do so participation of different stakeholders in every step of the process may be beneficial. The approach chosen should include wider ideas of people related to the ship and its work, but not become overly burdensome in its approach. In the description of phases several parties are mentioned that could be consulted.



**Figure 1.** *Different stages and elements in the Clean Ship process*

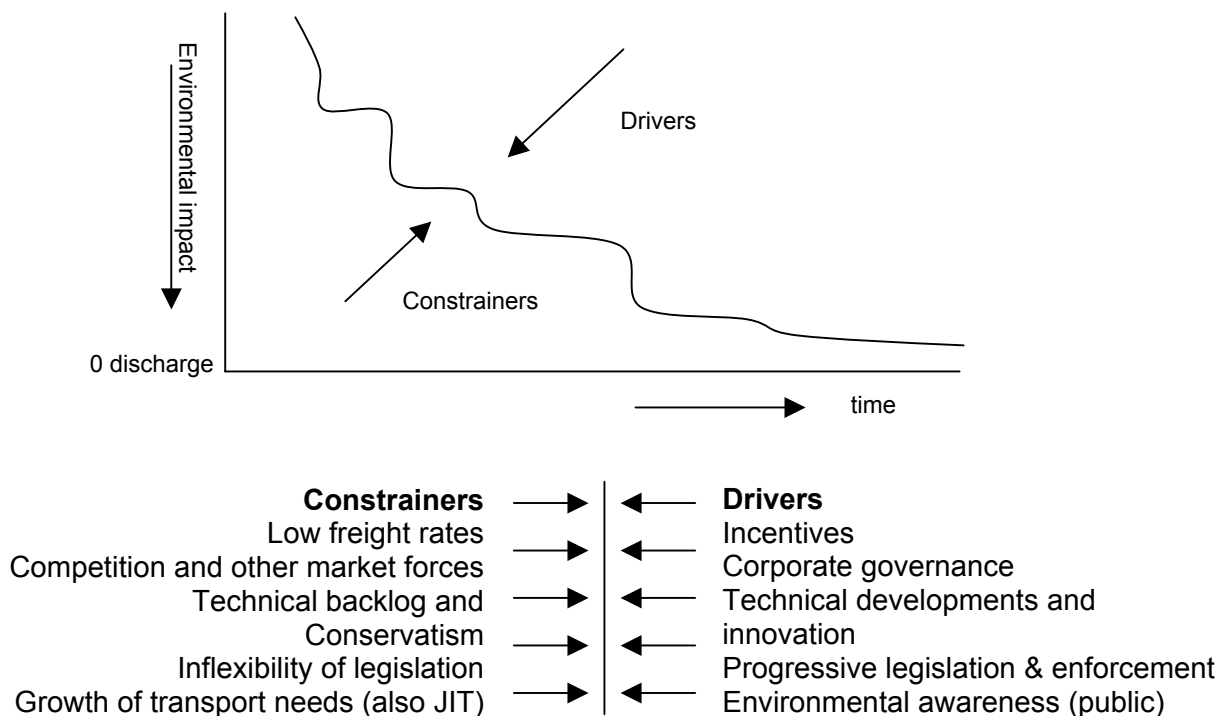
*Note: the question marks indicate a question whether a certain parameter is met. E.g. Dual Systems? means: have dual/redundant systems been considered and included?*

## Chapter 3: Force Field and Actor Analysis

### 3.1 Force field analysis

Several driving forces are important in influencing on how the environmental performance of shipping is changing through time. Some major driving forces e.g. the need for faster vessels in some transport segments, have negative influence on the environmental impact of shipping, and some driving forces, e.g. environmental awareness in the public and in the market, have the opposite impact.

It is important to have an understanding of the trends in order to decide upon a strategy towards Clean Shipping. Some of the parameters are directly decided upon by authorities, some indirectly, and some hardly at all. Figure 2 below is an illustration of the driving forces and the influence on the environmental impact of shipping.



**Figure 2.** *Divers and Constrainers towards the Clean Ship approach*

*Constrainers* are those factors making it difficult for players in the maritime industry to work towards sustainable shipping. Eliminating these factors facilitates Clean Shipping. Many have to do with the market forces and small profit margins in the industry. Technical backlog is also an important factor. On the governmental side legislation may sometimes be too prescriptive of sub optimal situations, meaning that there is little room for creativity. One of the examples could be the relationship between the measurement of Gross Tonnage and the open top containership. In that case the open top containership is constrained due to an increased taxation.

Besides the technical and market mechanisms, the personal side of shipping is important. On the one hand, ship owners may not always be aware of the environmental aspects of their operation, on the other hand the crew and the customers of the ship may not care either. Influencing the awareness of all people involved in shipping (see the actor analysis further below) can be an

important tool towards the Clean Ship approach. The experience so far is that if people know more about the impacts of their activities they are more likely to take caution in those activities.

*Drivers* are factors currently present in the shipping industry that stimulate sustainability. These are also factors that can be strengthened to stimulate sustainability. Currently especially corporate governance is a strong stimulator for a sustainable niche market. ISO 14001 is one of the instruments both customers and shipping companies can use to show their commitment to environmental performance. Technical developments, for example in engine design and building, have also helped environmental performance. In future further development of technology may eliminate many of the environmental impacts we currently face. Economic Incentives may be a strong instrument to stimulate economic development and environmentally sound conduct.

Legislation and enforcement will however remain an important tool to regulate the environmental effects of shipping. Implementation and enforcement of legislation is however often lacking, and may need to be strengthened. An important driver is also the public awareness of many of the problems associated with shipping. Examples such as the Erika and the Prestige serve to show that public attention has a strong effect on the actions undertaken to regulate shipping. A more general knowledge of the marine environment may stimulate a more pro-active approach to regulating shipping. Several of the actors in the shipping industry are not directly involved in operating the ship and are thus not often in contact with the environmental impact the ship has. Educating these actors may aid significantly the ease of implementation of many environmental measures.

### **3.2 Actor Analysis**

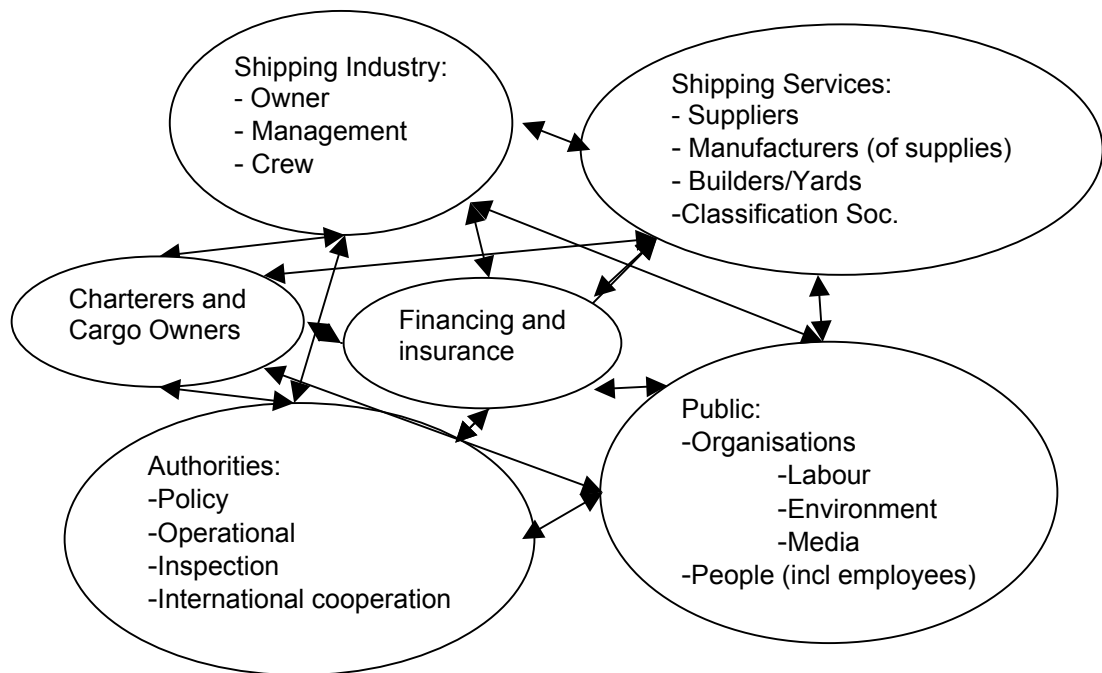
In analysing the trends that have influence on the environmental impacts from shipping it is vital to information of the actors involved and their influence. Hence, when considering possible actions to be included in a Clean Ship approach, the most important actors can be targeted. Developing a coherent and strong communication strategy is key to the implementation of the approach.

Figure 3 gives an overview of the actors involved and how they are interlinked. This figure is meant to give an overview of actors and to illustrate the fact that they are all interlinked. The picture given is one of a complex and entwined industry where actors interrelate to create a certain outcome.

*Description of actors:* The outcome of a process is to a large extent dependent on the actors involved. In analysing the process towards the Clean Ship approach the most important actors are the shipping industry, shipping services, financing and insurance companies, charterers and cargo owners, Authorities and the Public. The shipping industry is the actor with the most direct effect. It concerns the ship itself and its crew, as they are involved in the day-to-day operation. Shipping services concerns all actors that are involved in the building, servicing, certification and recycling of the ship: basically the ship's lifecycle, except for the day-to-day operation. Financing and insurance companies create the financial drivers that influence decisions on the designing and building of a ship.

The charterers and cargo owners form the ships' market. They determine whether environmental performance creates an added value or not. Long-term assessments should play a larger role in the decisions made in this arena. The last two categories of actors concern the public and the authorities acting on their behalf. Authorities are most often on the side of creating regulations and on inspection of ships. The public itself influences many of the other actors through its buying behaviour and through its influence in democratic elections. A lack of awareness of

environmental problems may create a lack of justification for higher prices or stronger regulations.



**Figure 3:** *Overview of Actors in the Shipping Industry*

## Chapter 4: Monitoring and Reporting

This chapter outlines a possible monitoring system that can be used to see whether progress towards the Clean Ship concept is on the right course. It is not meant as an overview of the parameters on which the Clean Ship should be built: this is described in chapter 2.

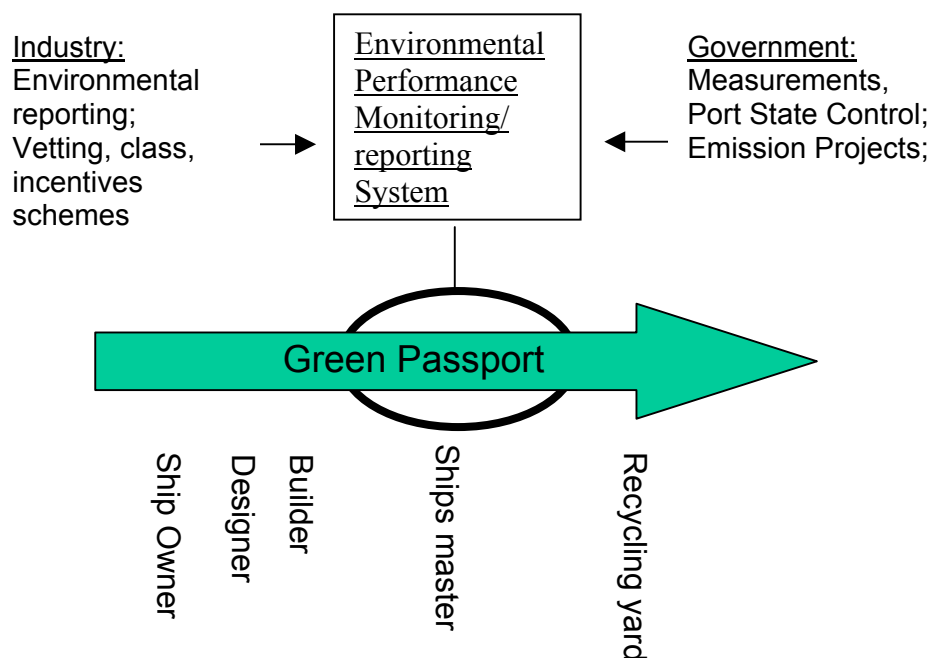
### 4.1 Establishing a system for environmental reporting and monitoring

The establishment of a system for environmental reporting and monitoring should be considered as a part of the Clean Ship approach. Such a system should involve Governments and the shipping industry (e.g. Green Passport; figure 4).

The Shipping industry should implement Environmental accounting systems and initiate environmental reports. Such tools are important in order to monitor developments, learn about ship types and ship operation and in order to initiate measures. Information at micro level (each ship) is important in order to estimate and verify information at macro level.

North Sea States should also monitor the environmental emissions and discharges from shipping. There are several options: one is to monitor emissions and discharges in a defined geographical area, another is for a state to monitor all ships flying its flag regardless of the area it operates in. A monitoring system for the North Sea region is feasible if there is commitment from North Sea States to allocate resources to develop such a system.

There are several possibilities in existing tools (IMO requirements) combined with international databases that can form the basis in a monitoring system for the region.



**Figure 4.** *Structure of Monitoring Systems for progress towards the Clean Ship*

## 4.2 Parameters to be monitored

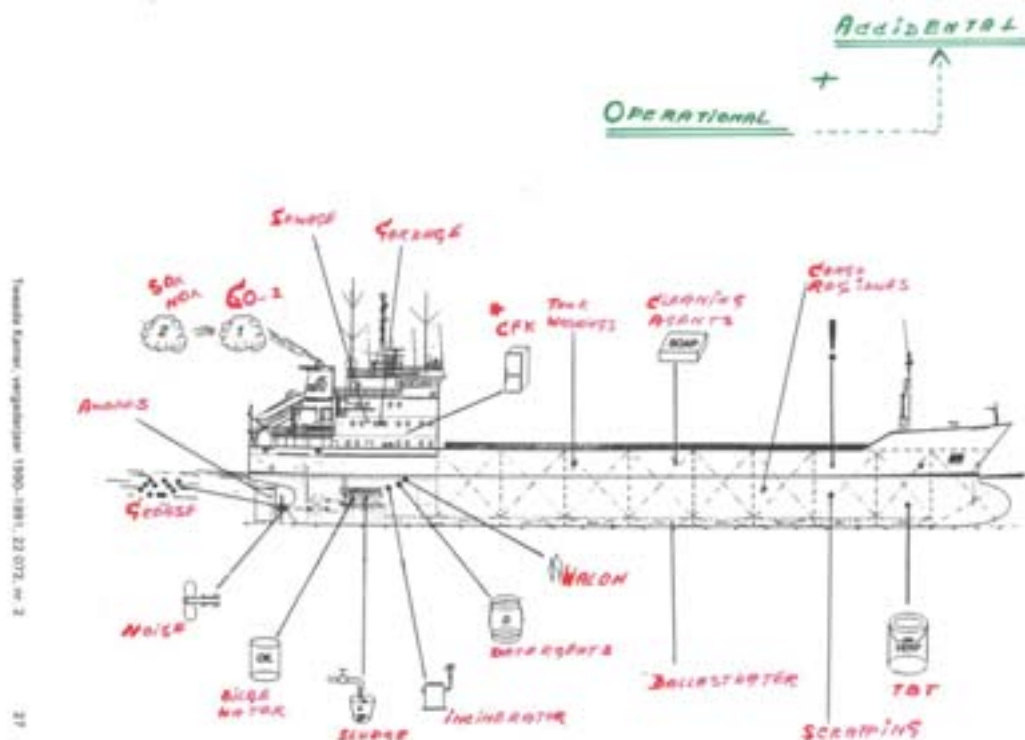
The Clean Ship Approach includes many environmental parameters as described in chapter 2. However, some parameters need to be commonly agreed upon as the most important for monitoring purposes. This is also important if a system for reporting and/or monitoring is to be established. Different environmental problems may have differing geographical scopes. This may mean that certain problems are well addressed in port on a local scale and others may need a global approach.

The parameters in bold in table 1 are proposed to be key parameters for monitoring.

<i>Emissions to air</i>	<i>Discharges to water</i>	<i>Accidents</i>
CO2	Oil	Cargo
NOx	Hazardous substances/	
Sox	Chemical (incl.	
Ozone Depleting Substances	cleaning additives)	
(Halons, CFC, HCFC)	Garbage/Waste	
	Sewage	
	Ballast Water	
	Biocides (e.g. AFS)	

These parameters are chosen to represent emissions to all environmental compartments as depicted in figure 5. It is not meant to be an exhaustive list of all possible impacts, but rather an approach that covers the most important ones and allows for a practical monitoring methodology.

In addition the list includes accidents, which may have an important effect on the environment. The fuel quality and consumption is an indirect measure of environmental performance, but can supplement information on NOx and SOx emissions with information on heavy metals and other fuel constituents. Other air emissions such as CO2 are becoming increasingly important. Ballast



**Figure 5:** *A ship's emissions visualised (to be further developed)*

Water is a new, and complicated aspect to monitor. At least information about quantities, port of origin and port of discharge can provide significant information. In later stages this could be linked to more elaborate risk assessment methodologies as they are developed and implemented in the OSPAR and North Sea regions. The information on accidents and their environmental impact may help in future to address associated problems.

#### **4.3 Link between monitoring and actions**

From the monitored parameters two aspects can be distilled. The first is that the success of activities can be measured on a scale of improved environmental performance of ships. The second is that identifying key parameters on the interface of the ship and its surroundings can allow the setting of objectives for the different parameters. Meeting or not meeting these set objectives can then lead to new or different measures.

## **Chapter 5: Activities for the North Sea States**

This chapter outlines possible actions that can be considered for the ministers to agree upon at the Ministerial Conference in 2006. Emphasis should be on what helps most to improve the environmental performance of ships as measured against the monitoring parameters described in chapter 4. Often this may mean improving the implementation of existing measures rather than starting new ones. Other approaches to improve the performance can however be sought in parallel. For each activity and action chosen there are global or regional developments that may need to be taken into account. These need to be identified and coordinated with the Ministerial Declaration.

Four main categories of actions should be considered:

- 1) Market-based actions,
- 2) Legislation,
- 3) Actions that stimulate innovation, and
- 4) Activities to increase awareness.

The geographical scope should be determined for each action.

### **Category 1) Market based actions**

The economic and administrative factors that are important in how the markets develop are normally outside the toolbox that the maritime authorities have (and the authorities in general). In this context the market-based actions, which should be considered, are:

- The introduction and stimulation of incentives (administrative and economic). There are systems available in several North Sea States. A firm commitment to implement such systems widely and to take the initiative to develop such a system globally should be a priority item in preparing for the Ministerial Meeting;
- Building Awareness and marketing of the Clean Ship Approach;
- Monitoring and reporting. Specification of the commitment to establish a monitoring system for the North sea region should be a priority item in preparing for the Ministerial Meeting;
- Private actors to introduce incentives.

### **Category 2) Legislation**

New legislation should be considered, but also the implementation and enforcement of existing regulations. Technical requirements are normally developed as minimum requirements for ships. Therefore the regulatory regime is normally not the driving force in the development of BAT and BEP. In some cases though, as for the forthcoming International Convention for the Control and Management of Ships Ballast Water and Sediments, the requirements can lead to technology development. With respect to the Clean Ship approach, the following should be considered:

- Creating an approach to regulations which alleviates the regulatory burden on “Clean Ships”;
- A screening of the regulatory regime in order to establish the best solution before developing new legislation;
- Creating an inspection regime which awards points for environmental performance; The North Sea States should investigate the US Point System;
- Develop all risk insurance for ship owners.

### **Category 3) Actions that stimulate innovation**

Innovation in relation to technical and operational improvements is essential to achieve new steps in the Clean Ship approach. Funding of R&D activities is vital in succeeding within this area. Also important is the notion of not transferring an environmental problem from one compartment of the environment to another through the technical solutions chosen. The North Sea States should therefore investigate:

- To establish or direct R&D programmes towards “Clean Ship Innovations”;  
Prepare commitments for North Sea States;
- To provide for the needed funding;  
Prepare commitments for North Sea States;
- To evolve a rotating fund through which experimental technologies can be tested in practice on a “no cure, no pay” basis;
- To facilitate pilot programmes;
- To establish creative forums where the parties involved are challenged to discuss new ideas;
- To stimulate shipbuilders to develop sustainable innovations together with ship owners.
- Learning from other industries such as aviation, road transport, medical sector or others may also help identify good improvements for the shipping sector.

### **Category 4) Activities to increase environmental awareness**

The environmental awareness of many of the involved actors jointly determines the environmental performance of the shipping industry. The different actors may need to be approached in different ways, but activities should be developed to that effect. Many of these activities can achieve a significant effect with relatively low levels of funding. The North Sea States could:

- Draft a communication strategy;
- Assess ongoing activities in environmental awareness;
- Assess the need for further activities;
- Find creative ways to provide cost effective awareness building activities such as the model used in Business for Social Responsibility;
- Amend STCW to include environmental awareness;  
to be investigated by North Sea States in preparing for the Ministerial Meeting.

#### **Can activities be further structured?**

In terms of agreeing on actions in the ministerial declaration it may be good to determine a phasing or structuring of activities. On the one hand this will help define dates for completion of activities, on the other it may also help identify missing steps. The figure below attempts to phase the activities towards the clean ship approach.

The planning starts with the end vision and works its way backwards (back-casting). The four possible phases identified are creating policy awareness, implementing programmes and regulations, obtaining experience through practice and evaluation of the programmes and measures and finally a stage of realisation sometime in the future.

As was identified on earlier IGSS meetings, there may be many solutions that are simple to implement in the short term. These could be taken up in their own timescale.

