

# **CLEAN SHIPPING INDEX**

**Guidance Document  
Version 2  
January 2010**

**Developed by the  
Clean Shipping Project  
Gothenburg, Sweden**

## **CONTENTS**

|   |            |
|---|------------|
| <b>WHAT IS THE CLEAN SHIPPING PROJECT</b>             | <b>3.</b>  |
| <b>INTRODUCTION TO THE REVISED INDEX<br/>DATABASE</b> | <b>4.</b>  |
| <b>GUIDANCE FOR CARRIERS</b>                          | <b>5.</b>  |
| <b>GUIDANCE FOR CARGO OWNERS</b>                      | <b>16.</b> |
| <b>VESSEL SCORING</b>                                 | <b>18.</b> |
| <b>CLEAN SHIPPING RECOMMENDATIONS</b>                 | <b>21.</b> |
| <b>REFERENCES</b>                                     | <b>22.</b> |

## **WHAT IS THE CLEAN SHIPPING PROJECT?**

Shipping is basically an environmentally sound way of transporting goods and people. It is energy efficient and has comparatively low demands on infrastructure. The international character of shipping has, however, led to an exemption from a large portion of the environmental demands placed on land-based means of transport and enterprises.

Shipping today causes a number of health and environmental problems. For a large number of parameters for instance NO<sub>x</sub>, SO<sub>x</sub>, particulate matter (PM), carcinogenic oils, oily bilge water, cleaning chemicals etc., the handling on board and the emissions to air and sea are unacceptable. For some parameter there are changes in the “pipeline” for example through regulations by the International Maritime Organization (IMO), but generally these problems acutely need to be addressed.

Aside of rules and regulations there is another strong environmental development force for shipping yet rarely assessed. It is the power of market demands from purchasers of sea transport. If reasonable but significant environmental demands could be coordinated from large cargo owners like export/import industries and companies, a “win-win” situation could be created. This would be beneficial for quality shipping companies, subcontractors for clean technology and last but not least – the environment itself.

The Clean Shipping Project started 2007 with the ambition to enhance this process from a regional/national perspective. The commissioners today are regional actors in Gothenburg and the west of Sweden – but also a number of large export- and import companies of Sweden. It is the Region of Västra Götaland, the Västra Götaland County Administration, the Gothenburg Region Association of Local Authorities and the City of Gothenburg. The supporting companies in the Clean Shipping Network may be found on our homepage ([www.cleanshippingproject.se](http://www.cleanshippingproject.se))

The Project developed a Clean Shipping Index consisting of a questionnaire of 20 basic, not so complicated questions on environmental performance. They all go beyond existing rules and regulations and covers existing ships of ten different types. The Index is focused on the vessels’ operational impact on the environment and scoring is obtained in five different areas: SO<sub>x</sub> and PM emissions, NO<sub>x</sub> emissions, CO<sub>2</sub> emissions, Chemicals, Water and waste control. The information should be filled in on a “ship to ship” basis but the scoring is added to a total carrier score. A ranking is done based on the scoring.

The information is collected in the Clean Shipping Index Database. To this database the members of the Clean Shipping Network have access. To be a member for the moment you have to be a Swedish cargo owner accepted by the Project. The membership will involve a small administrative fee from 2010 and you have to sign a Letter of Intent and a Confidential Agreement to get access to the database. However the Project has the ambition to open the database for more general use in the long run.

The Clean Shipping Project is aiming at having a verification protocol in place and also to invite international cargo owners to join the project during 2010. The Clean Shipping Project has a budget until the end of 2011. After that the “project” will transform into a more long-term administrative body.

## **INTRODUCTION TO THE REVISED INDEX DATABASE**

The Clean Shipping Index was introduced in June 2008. In August 2008 the Clean Shipping Index Database was created to handle all the information presented by carriers in the Index Questionnaire. Along the way it has become evident that some adjustments have to be made in order to get the Index easier to understand and fill in - but also to make it more relevant to real technical and environmental conditions and compatible with other questionnaires or surveys. Another important task for this revised version is to introduce the possibility for a verification process to be carried out by a third party.

Doing these changes we have listened closely to carriers, cargo owners, maritime subcontractors, classification societies, maritime authorities, NGOs and the scientific community. However an ambition has been only to change things of utmost importance. Many carriers have presented good environmental information already and changes must be compatible with information already declared.

From 2010 the web-based Clean Shipping Index can be entered from three different positions. The *administrator*, i.e. the Clean Shipping Project, can see and change everything in the database. The *users*, defined as the members of the Clean Shipping Network, can see all information in the database but cannot change or edit anything. Finally the *carriers* or the vessel operators/owners, can enter and edit the information on their own fleet. They can also see a general comparison to other carriers but no detailed information. All these actors have/can get a unique password for their access.

The ranking of carriers was earlier based on the total average score for the reported ships. This is changed to a ranking based on total average score *multiplied* with the percentage reported ships of total owned or managed fleet. There is also a *group ranking* introduced based on total average score for the same type of carriers, and again multiplied with the percentage reported ships of total fleet.

The main changes in the questionnaire compared to the first version, are on CO<sub>2</sub> and on SO<sub>x</sub> & PM. The CO<sub>2</sub> scoring is now focused on performance rather than measures. The SO<sub>x</sub> scoring is divided into both ECAs and global activity and a wider spread of scoring to different sulphur content in fuels are introduced. Further explanations will come later in this document.

Some other refinements are included as predetermined routes or trade lanes – compatible with the work of BSR (Business for Social Responsibility, USA). Some parameters have ended up as IMO requirements and are therefore abandoned. Carriers who have presented information to the first index version will find their data in the revised version, except CO<sub>2</sub> and SO<sub>x</sub>. The information has to be updated into the new version. It should be emphasized the importance of controlling that earlier data is correct.

This document will present detailed guidance for filling in the questions for the carriers. It will also present a general guidance for the user and give some hints what is possible to see. It is recommended to print out the Guidance Document and carefully follow the instructions and explanations, both as a reporting carrier or as a user of the database. If there are any questions or uncertainties – do not hesitate to contact the Clean Shipping Project.

## **GUIDANCE FOR CARRIERS**

When you logged in with your username and password you will come to the **Welcome page**. Please read through this so all circumstances are clear!

You are best off by start to enter the **Carrier/ Home** page in the left column. You enter **edit information** on the top of the page. If this is the first time you enter the database you should fill in the fields showing. If there already is information here, you just check that it is correct and fill in what is missing.

Note: The maximum time you may be logged in *and* inactive is 2 hours. After that you automatically will be logged out and all new information that is not submitted or updated will be lost.

Note also that all earlier scoring on CO<sub>2</sub> and SO<sub>x</sub>& PM in the ranking tables is nullified, due to the new enhanced scoring system.

The following information is needed on carrier level:

### **CARRIER INFORMATION**

#### **Carrier**

**Shipping line:** The shipping line which own, manages or operates the reported vessels.

**Website:** The website address to the shipping line.

#### **Contact**

**Responsible person:** The contact person who is the main contact with the carrier and responsible for all the information presented.

**Phone number:** International telephone to the responsible person.

**E-mail address:** The direct email address to the responsible person.

#### **Vessel count**

**Operated vessels:** The total operated vessels by the carrier

**Owned/ managed vessels:** The total owned or managed vessels by the carrier.

#### **CO<sub>2</sub>**

**Does your company have a CO<sub>2</sub> reduction goal?** Yes or no.

**Target (%):** The target figure in %, if there is a goal.

**Target year:** The year when the target shall be reached.

**Baseline year:** The year from which the target is set.

**Reduction type:** Is the target absolute or per transported unit?

**Update:** When you have filled in the questions above you just click on the update button and the information will be submitted into the database. You will then automatically enter the home page again and find your information both on carrier level and on vessel level (when you have added vessel information). The full information access on the carrier home page will be described later in this document.

### **Add Vessel/ Edit Vessel**

When you are going to add a new vessel to the database you enter **Carrier/ Add vessel** in the left column of the home page. If you want to complete or change information on a vessel already in the database you enter **list of vessels** in the top of the home page and click on the IMO number of the concerned vessel in the vessel ranking list. You will then come to Vessel information where you enter **edit vessel** on the top of the page. From here the questionnaire looks the same for both Add vessel and Edit vessel. We will now guide you through this.

**IMO number:** The three letters IMO directly followed by the unique and permanent seven digit number (ex. IMO1234567). The database will not accept two vessels with the same IMO number.

**Name of vessel:** The current name of the ship.

**Prepared by:** The person responsible for the information on this specific ship.

**Most recent update:** This will automatically be registered when a new ship is added or a change is edited and submitted.

**Year (new built/ major conversion):** The year the vessel was built or had a major conversion.

**Maximum payload:** The maximum weight of carried cargo in tonnes or TEUs.

**Deadweight tonnage (dwt):** The maximum total weight a ship can carry in tonnes.

**Type of vessel:** Select from the drop down menu.

**Owned/ chartered vessels:** Select from drop down menu. Note that time-chartered refers to vessels chartered for use for a period of 6 months or more and spot-chartered for periods less than 6 months.

**Index verified by:** Select from drop down menu. The verifier has to be accredited according to ISO/IEC Guide 65 (EN 45011) for a verification service. The verifier should also hold accreditation for applicable products according to the Clean Shipping Index.

**Environmental Management System:** Select from drop down menu which certification of the vessel that is conducted.

**Calculated CO<sub>2</sub> emissions in grams/tonne-nm:** Calculated according to IMO's Energy Efficiency Operational Indicator (3). The calculation should cover a period over one calendar year.

**Calculated CO<sub>2</sub> emissions in grams/TEU-km:** Calculated according to Clean Cargo Working Group CO<sub>2</sub> calculation formula (4) (26). This only applies to container ships. The calculation should cover a period of one calendar year.

**NO<sub>x</sub> emissions from main/auxiliary engines:** For engines larger than 130 kW, NO<sub>x</sub> emission data in g/kWh, along with engine rpm, should be presented. A number of options for finding this data are at hand, which is in accordance with the Norwegian Maritime Directorates guidelines on NO<sub>x</sub> taxation (5).

**Year:** This should reflect the applicable NO<sub>x</sub> certification date for a particular engine as defined by Revised MARPOL ANNEX VI (6), taking into account the relevant requirements related to "major conversions".

**Total effect:** This should be the total effect of all main or all auxiliary engines.

**NO<sub>x</sub> emissions (g/kWh):** If the engine is installed on a ship constructed on or after 1 January 2000, the data will be found in the EIAPP certificate (6).

In cases where a NO<sub>x</sub> reducing device is fitted but not part of an engine's NO<sub>x</sub> certification, such systems are to be covered by verification procedures required by the NO<sub>x</sub> Technical Code 2008, demonstrating that the claimed application cycle value is being achieved (6).

The same applies when performance of a pre-2000 engine is claimed having the appropriate application cycle weighted value within either the Tier I or Tier II limit.

Measurements of NO<sub>x</sub> emissions according to the regulations by the Swedish Maritime Administration for reduction of fairway dues, are also acceptable (7).

If SCR (Selective Catalytic Reduction) is installed as a post-combustion reduction technique there must not be an ammonia-slip (NH<sub>3</sub>) above 10 ppm, according to the Swedish Maritime Administration (7).

If none of these options are at hand NO<sub>x</sub> data should be calculated by table factors found in Section 3-19-9 in the Tax on emissions of NO<sub>x</sub> (8):

*Engines*

|                               |   |
|-------------------------------|---|
| <i>Rpm less than 200:</i>     | <i>100 kg NOx per tonne of energy product</i> |
| <i>200 rpm to 1,000 rpm:</i>  | <i>70 kg NOx per tonne of energy product</i>  |
| <i>1,000 rpm to 1,500 rpm</i> | <i>60 kg NOx per tonne of energy product</i>  |
| <i>1,500 rpm upwards</i>      | <i>55 kg NOx per tonne of energy product</i>  |

For converting the emission factors 1 kg NOx/tonne bunkers into specific NOx emissions in g/kWh, table 7 and 8 in MEPC 58/INF. 6 (9) should be applied:

*Main engine specific fuel consumption values (g/kWh)*

| <i>Engine age</i>   | <i>Above 15000kW</i> | <i>15000-5000 kW</i> | <i>Below 5000 kW</i> |
|---------------------|----------------------|----------------------|----------------------|
| <i>&lt;1983</i>     | <i>205</i>           | <i>215</i>           | <i>225</i>           |
| <i>1984-2000</i>    | <i>185</i>           | <i>195</i>           | <i>205</i>           |
| <i>2001-present</i> | <i>175</i>           | <i>185</i>           | <i>195</i>           |

*Auxiliary engine fuel consumption values (g/kWh)*

| <i>Engine age</i> | <i>Above 800 kW</i> | <i>Below 800 kW</i> |
|-------------------|---------------------|---------------------|
| <i>Any</i>        | <i>220</i>          | <i>230</i>          |

NOx averages: If there is more than one main engine or more than one auxiliary engine installed, the power weighted emission value should be presented. The principal calculation of this will be:

Engine 1:  $x \text{ g/kWh} * y \text{ kW} = xy$ ;

Engine 2:  $z \text{ g/kWh} * a \text{ kW} = za$

Power weighted average:  $xy+za/(y+a)$ ;

where x and z are the NOx emission values ; y and a are the engine powers.

Shore-side electricity: In case of shore-side electricity installed and used in all applicable harbours, Tier III values may be filled in under NOx auxiliary engines.

**Rpm:** Rated engine speed in revolutions per minute.

**Trade lanes/ Routes:** Trade lanes are limited to a number of 24 predetermined options. The declared route should be that of 31<sup>st</sup> December the reporting year. If the ship operates on more than one route during the year, you may just mark the other ones also. For container vessels the marking of trade lanes gives a basis for CO2 scoring below if values are presented according to the Clean Cargo Working Group calculation formula (4).

**VESSEL PERFORMANCE****SOx and Particulate Matter (PM)**

**SOx/PM main engines/auxiliary engines:** The basis for scoring is the average sulphur content in fuels for main and auxiliary engines used during a calendar year. The averages should reflect the tonnage weighted sulphur content. The reason for including PM in the scoring is the close link between SOx emissions and PM emissions (27).

Just complying with global standards does not score. Sulphur testing procedures should follow the Revised MARPOL Annex VI (6). Sulphur analysis protocols should be found on board.

Under this parameter it is possible to fill in three fields: *Operations in non-ECAs and ECAs (total yearly average)*, which means the yearly average of sulphur in fuel for the total consumption in main engines. *Operations in ECAs (yearly average)*, which means the yearly average of sulphur in fuel exclusively used in ECAs for main engines. *Auxiliary engines*, means the yearly average of sulphur used in fuel for auxiliary engines.

However if you report Fuel quality  $\geq 2.5$  % S as total yearly average in the first field, the

possibility to fill in and get scores under Operations in ECAs, disappears.

Note that if you *only* operate inside ECAs alternatively *only* outside ECAs and fill in one of these options, the scoring will double from what you get in ECAs alternatively in non-ECAs/ECAs.

The use of abatement technology is acceptable as long as the demands in Annex VI of MARPOL are fulfilled. The corresponding total emission weight of sulphur dioxides should not exceed 6.0 g SO<sub>x</sub>/kWh when a fuel sulphur content of 1.5% is claimed or required. Additionally 4.0 g SO<sub>x</sub>/kWh corresponds to 1% S and 2.0 g SO<sub>x</sub>/kWh to 0.5% S.

The use of the term ECAs (emission control areas) in the questionnaire refers to *both* SECAs and ECAs.

The scoring options above <0.8% S in ECAs is only applicable until July, 2010.

## NO<sub>x</sub>

**NO<sub>x</sub> main engines/auxiliary engines:** The basis for scoring is how the NO<sub>x</sub> emissions from main/auxiliary engines relate to the standards set in the Revised MARPOL Annex VI (6). Actual figures should be declared under the NO<sub>x</sub> field above. If several engines are installed a mean value should be presented. For calculation see **NO<sub>x</sub> averages** above.

Just complying with global standards does not score. The emission levels mentioned are tied to the same levels as defined in the Tier I, II and III in the Annex VI, with one exception. Between Tier II and III there is a level included to reward different pre-combustion NO<sub>x</sub> reduction techniques. Note that the timetable or special areas tied to the different Tiers are not included in the scoring.

The tier I level or “IMO-curve” is defined as the following emissions of total weighed NO<sub>2</sub>:

- 17.0 g/kWh when the rated engine speed ( $n$ ) is less than 130 rpm (revolutions per minute);
- $45 * n^{(-0.2)}$  g/kWh when  $n$  is 130 or more but less than 2,000 rpm;
- 9.8 g/kWh when  $n$  is 2,000 rpm or more.

The tier II level is defined as the following emissions of total weighed NO<sub>2</sub>:

- 14.4 g/kWh when  $n$  is less 130 rpm;
- $44 * n^{(-0.23)}$  g/kWh when  $n$  is 130 or more but less than 2,000 rpm;
- 7.7 g/kWh when is 2,000rpm or more.

The tier III level is defined as the following emissions of total weighed NO<sub>2</sub>:

- 3.4 g/kWh when  $n$  is less than 130 rpm;
- $9 * n^{(-0.2)}$  g/kWh when  $n$  is 130 or more but less than 2,000 rpm;
- 2.0 g/kWh when  $n$  is 2,000 rpm or more;

### Database scoring

The database will calculate the scoring you will get, according to the above formulas and the data you presented about the actual NO<sub>x</sub> emissions earlier. Just click on the **Compute** button. Note that if you change or edit some NO<sub>x</sub> information you have to click the Compute button again.

## CO<sub>2</sub>

**CO<sub>2</sub> emission information:** The basis for scoring is reporting annual CO<sub>2</sub> emission data for a calendar year. Calculation references are given under CO<sub>2</sub> field above. Actual figures should also be declared under the CO<sub>2</sub> field above. Two options are accepted. Either data according to MEPCs Energy Efficiency Operational Indicator EEOI (3) or for container vessels there is an additional option to report data according to the Clean Cargo Working Group (BSR) calculation formula (26)(appendix). Basic information for carrying out these calculations is *the cargo carried, the distance travelled and the fuel consumption*.

**CO<sub>2</sub> emission performance/ EEOI:** The basis for scoring is how well a vessel is performing compared to a reference ship. To get scores the vessel must have an emission below this reference.

The Energy Efficiency Operational Indicator (EEOI) for the reference ship is obtained in two steps. First the Energy Efficiency Design Index (EEDI) is calculated. This is done based on the methods outlined by the Greenhouse Gas Working Group of IMO (24). In this document baselines are defined for the most common ship types of the world, expressing ideal technical circumstances but not including operational features. The baselines are presented as functions between deadweight (dwt) and emitted grams CO<sub>2</sub> per tonne-nm. The functions are derived from Lloyds Fairplay data covering ships constructed between January 1998 and December 2007.

The EEDI thus gives an average fuel consumption for a specific ship (type and size) that carries a cargo corresponding to the dwt. The EEDI are in the IMO documents presented as function of dwt for seven different categories of ships (see below).

|                     |                              |
|---------------------|------------------------------|
| General cargo       | $EEDI = 290.28dwt^{-0.33}$   |
| Reefer (gen. cargo) | $EEDI = 290.28dwt^{-0.33}$   |
| Bulk                | $EEDI = 1354dwt^{-0.5117}$   |
| Tanker              | $EEDI = 1950.7dwt^{-0.5337}$ |
| Container           | $EEDI = 139.38dwt^{-0.2166}$ |
| RoRo                | $EEDI = 20528dwt^{-0.7165}$  |
| Car carrier (RoRo)  | $EEDI = 20528dwt^{-0.7165}$  |

where dwt is the deadweight in tonnes and EEDI the average design index value in grams CO<sub>2</sub>/ tonne nautical mile.

In the second step operational factors are accounted for. This means that estimated average load factors and estimated payload factors are taken into account.

The load factors (ratio of actual load to maximum load on mass basis) assumed for the reference ships are taken according to NTM (25):

|               |      |
|---------------|------|
| General cargo | 0.6  |
| Reefer        | 0.6  |
| Bulk          | 0.6  |
| Tanker        | 0.55 |
| Container     | 0.8  |
| RoRo          | 0.88 |
| Car carrier   | 0.9  |

For some type of vessels the payload ratio (ratio of maximum weight commercial cargo to the deadweight) is an important factor when calculating the EEOI for the reference ships. General payload ratios are given for some type of ships below. The values used here are based on information from ship constructors and ship operators:

|               |      |
|---------------|------|
| General cargo | 0.9  |
| Reefer        | 0.9  |
| Bulk          | 0.9  |
| Tanker        | 0.95 |
| Container     | 0.8  |
| RoRo          | 0.5  |
| Car carrier   | 0.25 |

Using the EEDI baseline functions and considering load factors and payload factors, the calculation for an operational reference value will generally look like this:

$$EEOI_{ref} = EEDI / (\text{load factor} * \text{payload ratio}).$$

The actual calculated EEOI for the vessel is compared with the calculated  $EEOI_{ref}$  for the vessel. Depending if and how much below the reference the actual EEOI is, a scoring is obtained.

Additional ship types EEDI baseline functions should be presented by IMO in March 2010 and will be incorporated in the Clean Shipping Index after that.

#### Database scoring

For CO<sub>2</sub> emission information you fill in the applicable field.

For CO<sub>2</sub> emission performance all data is already entered (if you have filled in correctly) and a click on the **Compute** button will give you your scores according to your data and the above formulas. Note that if you change or edit some CO<sub>2</sub> information you have to click the Compute button again.

**CO<sub>2</sub> emission performance/ CCWG:** This only applies to container vessels. The basis for scoring is how well a vessel is performing compared to a reference. To get scores the vessel must have an emission below this reference. The Clean Cargo Working Group (CCWG) references are obtained from calculated averages for standardized trade lanes. The use of reefers is not included. The averages are based on CCWG empirical data from preceding year (26). However the option *Other* trade lane is not included.

| Standardized trade lane  | CCWG Average (g CO <sub>2</sub> / TEUkm) |
|--|--|
| <i>Asia – Africa</i>   | 81.7                                     |
| <i>Asia – Mediterranean</i>                                    | 83.1                                     |
| <i>Asia – Middle East/India</i>                                | 92.8                                     |
| <i>Asia – North America EC*</i>                                | 89.0                                     |
| <i>Asia – North America WC**</i>                               | 82.8                                     |
| <i>Asia – North Europe</i>                                     | 74.4                                     |
| <i>Asia – Oceania</i>  | 91.8                                     |
| <i>Asia – South America (EC/WC)</i>                            | 90.4                                     |
| <i>Europe (North&amp; Med) – Africa</i>                        | 108.5                                    |
| <i>Europe (North&amp; Med) – Middle East/ India</i>            | 92.0                                     |
| <i>Europe (North&amp; Med) – Oceania (via Suez/via Panama)</i> | 98.7                                     |
| <i>Europe (North&amp; Med) – Latin America/ South America</i>  | 86.4                                     |
| <i>Intra –Americas (Caribbean)</i>                             | 109.1                                    |
| <i>Intra – Asia</i>  | 104.1                                    |
| <i>Intra – Europe</i>  | 117.7                                    |
| <i>Mediterranean – North America EC (incl. Gulf)</i>           | 86.9                                     |
| <i>Mediterranean – North America WC</i>                        | 69.5                                     |
| <i>North America EC – Middle East/ India</i>                   | 88.2                                     |
| <i>North America – Africa</i>                                  | 119.6                                    |
| <i>North America – Oceania</i>                                 | 103.1                                    |
| <i>North America –South America (EC/WC)</i>                    | 92.1                                     |
| <i>North Europe – North America EC (incl. Gulf)</i>            | 97.2                                     |
| <i>North Europe – North America WC</i>                         | 89.5                                     |
| <i>South America (EC/WC) – Africa</i>                          | 80.5                                     |
| *EC = East Coast   |  |
| *WC= West Coast  |  |

### Database scoring

For CO<sub>2</sub> emissions you fill in the applicable field.

For CO<sub>2</sub> emission performance the actual calculated CCWG data for the vessel is compared with the CCWG average (i.e. the reference) for the actual trade lane the vessel is using. If more than one trade lane is used per year the arithmetic average for the actual trade lanes is the reference value. Depending if and how much below the reference the calculated CCWG value is, the correct option is selected by the database by clicking on the **Compute** button. Note that if you change or edit any CO<sub>2</sub> information you have to click the Compute button again.

## **Chemicals**

**Antifouling:** The basis for scoring relies on what type of binder and what type of biocide that is included in the antifouling coating. A low-leaching but effective binder as for example hydrolysing SPC (self-polishing coating), do get scores when a more traditional CPD (controlled depletion polymer) does not. A general definition of an SPC may be that it is a binder which chemically reacts in sea water by hydrolysis and which segregate components which inhibits fouling.

An approach that scores higher is using SPC on the sides of the hull where fouling is most frequent, and a non-toxic coating on the whole bottom of the hull.

Non-toxic coatings i.e. coatings without chemical or biological activity and exempted from approval according to the Biocide Directive, do get high scores.

Only biocides accepted according to the EU Biocide Directive 98/8/EG Annex 1 (10) are allowed in the binders that scores. See table 1 below.

The data on antifouling of the vessel is found in the AFS certificate supplemented by the coating manufacturers, in the MSDS (Materials Safety Data Sheet) and in TDS (Technical Data Sheet). In certain cases a direct contact with the producer is needed. Random sampling may be done through coating analysis.

*Note that the demands above are from the environmental point of view. The functional features are totally the producers' responsibility. If a non-toxic product is chosen it is of utmost importance that it has a good function. Otherwise it may result in negative impacts in other environmental areas like an increased fuel consumption or/and increased transport of invasive species.*

Table1. Antifouling biocides applied for inclusion in Annex 1 to the EU Biocide Directive. (The only ones in question within foreseeable time, but all of them might not pass)

| <i>Name</i>   | <i>CAS nr</i> | <i>Rapporteur<br/>Member State</i> |
|---|---------------|------------------------------------|
| Tolyfluanid   | 731-27-1      | FI                                 |
| Dichlofluanid   | 1085-98-9     | UK                                 |
| Copper thiocyanate  | 1111-67-7     | FR                                 |
| Dicopper oxide  | 1317-39-1     | FR                                 |
| Copper  | 7440-50-8     | FR                                 |
| Zineb   | 12122-67-7    | IE                                 |
| Pyrithione zinc   | 13463-41-7    | SE                                 |
| Bis(1-hydroxy-1H-pyridine-2-thionato-O,S)copper                       | 14915-37-8    | SE                                 |
| N'-tert-butyl-N-cyclopropyl-6-(methylthio)-1,3,5-triazine-2,4-diamine | 28159-98-0    | NL                                 |
| 4,5-dichloro-2-octyl-2H-isothiazol-3-one                              | 64359-81-5    | N                                  |
| Tralopyril  | 122454-29-9   | UK                                 |
| Medetomidine  | 86347-14-0    | UK                                 |

**Stern tube oils:** The basis for scoring relies on the type of lubrication applied in the stern tube. Generally engine oils or gear oils based on mineral oil containing large amounts of additives, are used. Considerable amounts are leaking out in the oceans every year just by normal conditions due to over-pressure of lubricant in the stern tube.

Alternatives do however exist like lubricants based on biodegradable oil, water lubrication, or systems with technically advanced sealing systems (“air seal”).

The definition of a biodegradable oil is that it each main component (>5% by weight) should have a biodegradation >60% within 28 days. Testing should be according to ISO 9439 (11) or ISO 10708 (12) but ISO 9408 (13) may be accepted if the theoretical oxygen demand (ThOD) and a time period of maximum 28 days are chosen in the method.

The option “Not applicable” may be chosen if the vessel does not have a stern tube, for example if the propulsion is depending on azimuth thrusters only.

**External hydraulic fluids:** The basis for scoring relies on the type of external hydraulic system applied on board. Generally hydraulic fluids based on mineral oil are used, and in external application a leakage may lead to emission into the sea. There are several options for minimizing the risk for environmental damage. Namely the use of biodegradable fluids, the use of electrical power instead of hydraulic power or external hydraulic systems capped so that leakage will not reach the sea. The definition of a biodegradable hydraulic fluid is the same as for stern tube oils (see above).

**Gear oils for thrusters and/or controllable pitch (CP) propellers:** The basis for scoring is what type of gear oil that is used in thrusters and/or CP propellers. The option possible is using biodegradable gear oils in these applications. The definition of biodegradable gear oil is the same as for stern tube oils (see above). The option “Not applicable” may be chosen only when no thrusters **and** no CP propellers are installed.

**Boiler-/ cooling water treatment:** The basis for scoring is avoiding the use of chemical products, **or** components in the products, classified as carcinogenic, mutagenic or toxic to reproduction (CMR), according to the EU Dangerous Substance Directive (14). Additionally you should avoid the use of chemical products classified as sensitizing, toxic or dangerous for the environment according to the DSD directive, with the exclusion of nitrite. Nitrite is toxic but neither bioaccumulating nor persistent. Information on the features mentioned above should be found in the MSDS (Material Safety Data Sheets) for the chemical products in question.

**Cleaning agents:** The basis for scoring is avoiding the use of chemical products **or** components in the products, classified as carcinogenic, mutagenic or toxic to reproduction (CMR), according to the EU Dangerous Substance Directive (14). Additionally you should avoid the use of detergents classified as dangerous for the environment according to the DSD directive or with limitations in the EU Regulation on detergents (15). Organic solvents classified and with risk phrases on health and environmental danger according to DSD directive, should be avoided. The above information should be found in the MSDS (Material Safety Data Sheets) for the products in question. Detergents, surfactants or other components that disturb the installed bilge water treatment should be avoided. Information on approved surfactants is usually found on the website of the bilge water cleaning equipment manufacturer.

**Refrigerants:** The basis for scoring is what type of refrigerants that are used in cargo refrigerant plants, centralised air-conditioning and refrigeration systems installed on board. All these refrigerants have to comply with the demands. Reefer refrigerants are not included. The focus is put on ozone layer depletion potential (ODP) and global warming potential (GWP) as defined by the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer (16).

The ODP number is correlated to the effect of R 11(CFC) and the GWP number is

correlated to CO<sub>2</sub>. For scoring the refrigerants should be natural (NH<sub>3</sub>, CO<sub>2</sub>) or HFC (Hydro Fluoro Carbon) with ODP number= 0 and the GWP number <3500. Additional points are achieved if the GWP is below 1850. The information should be found in the MSDS (Material Safety Data Sheet) and TDS (Technical Data Sheet) for the refrigerants in question.

### **Water and waste control**

**Ballast water treatment:** The basis for scoring is how international vessels are treating their ballast water for to hinder transport of invasive species. Regional and coastal shipping are excluded and may fill in the option “Not applicable”. Ballast water exchange receives scoring but is not a final solution due to safety reasons, and fresh water could enhance growth of remaining organisms. Ballast water exchange should be conducted according to the proposed Ballast Water Convention (17) with corresponding guidelines (18). The Convention is still not fully ratified (June 2009). Information on ballast water exchange should be found in the Ballast Water Record Book or its equivalence. Ballast water management systems which received Type Approval Certification following Final Approval by IMO (19) get full scoring.

**Sewage/ black water:** The basis for scoring is how sewage water is treated in PSSAs (Particularly Sensitive Sea Areas). The options are either an approved sewage treatment plant according to MEPC (20) – Certificate of Type Approval for Sewage Treatment Plant – and a control of its usage and function through a maintenance record. An alternative option is that no sewage discharge in PSSAs can be shown through operation manuals.

#### Table 2. Particularly Sensitive Sea Areas

the Great Barrier Reef, Australia (designated a PSSA in 1990)  
 the Sabana-Camagüey Archipelago in Cuba (1997)  
 Malpelo Island, Colombia (2002)  
 the sea around the Florida Keys, United States (2002)  
 the Wadden Sea, Denmark, Germany, Netherlands (2002)  
 Paracas National Reserve, Peru (2003)  
 Western European Waters (2004)  
 Extension of the existing Great Barrier Reef PSSA to include the Torres Strait (proposed by Australia and Papua New Guinea) (2005)  
 Canary Islands, Spain (2005)  
 the Galapagos Archipelago, Ecuador (2005)  
 the Baltic Sea area, Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland and Sweden (2005)  
 the Papahānaumokuākea Marine National Monument, United States(2007)

**Garbage handling:** The basis for scoring is the garbage handling on board. There should be no incinerator on board or documentation of no incineration of garbage. Additionally there should be no waste overboard – food waste excluded – and separate garbage handling for reuse, recycling and disposal. This information should be found in the Garbage Record Book on board and the Garbage Management Plan according to Annex V in MARPOL 73/78 (21).

**Sludge oil handling:** The basis for scoring is the handling of sludge oil on board. There should be no incinerator on board or documentation of no incineration of sludge oil. Additionally there should be documented disposal of sludge oil to treatment facilities on shore. This information should partly be found in the IOPP (International Oil Pollution Prevention) Certificate according to MARPOL Annex I (22), or found in operating manuals on board.

**Bilge water treatment:** The basis for scoring is how the bilge water is treated on board. The complexity of bilge water mixtures today often results in stable oil/water emulsions, hard to be broken in traditional gravimetric separators. Scoring is received only if active treatment equipment is installed, calibrated and a documented emission of <5ppm oil in the disposed bilge water. This information should partly be found in the IOPP Certificate according to MARPOL Annex I (22), or found in operating manuals on board. Additional scoring can be received if an emission control box is installed. The box reassures that no oily water discharge is occurring and will register position and time continuously.

**Crew awareness:** The basis for scoring is a documented education for all crew on board with special emphasis on engine room personnel and handling of heavy fuel oil.

**Submit:** Below the questionnaire you will find a button saying Submit. When clicking on this button, all the information above will add into the database. However if there is some important information missing, nothing will be submitted to the database and the errors will show on the top of the page. The information has to be completed and another Submit click has to be done to get the information into the database. Congratulations – you may now automatically see **Vessel information** on the vessel you just added.

## VESSEL INFORMATION

You may continue to add or edit other vessels. If you have vessels with identical performance data you may use the function **use as template** on the top of the page which only erases IMO number and ship name of the vessel showing.

If you sell or anchor up your vessel for a long period you may also delete all info by enter **delete vessel**. This will erase the vessel from the database.

The vessel information page will present a spider diagram of the five different environmental areas and the scores for this specific ship. Putting the pointer on the different breaking points in the diagram will show the score percentage you have reached in these different areas for your ship.

The total score will be shown putting the pointer on the coloured performance field below. The performance levels are defined in the field but in more detail in the Clean Shipping Recommendations chapter below.

Under Routes at the bottom of the page you may enter **view in chart**. In the spider diagram an orange line now will show the mean values for all vessels of the same type in the database on that specific route. Your ship is not included in these mean values.

To see all the detailed information you have presented on your ship you may enter **view questionnaire** at the absolute bottom of the page.

## CARRIER HOME

When all your ships are added or edited you may view the result under **Carrier/ Home**. If you enter **list of vessels** on the top of the page you will see a ranking of all ships you have added. If you have different types of vessels in your fleet you may select only one type and rank them towards each other. A blue colouring is indicating how well you perform environmentally going from dark with low performance to very light with good performance. These colours are not connected with the Clean Shipping Recommendation colours but are used mainly for illustrative purposes.

If you want to rank your vessels according to some specific environmental field you may click on some of the orange headlines on the top of the table like **CO2** or **Chemicals**.

If you want to go back to Vessel Information for any of your ships you may click on the orange **IMO number** in the table.

If you want to change anything concerning carrier information you just click on **edit information** as described in the beginning of this document.

A chart is showing at the top of the page. This is presenting the **total weighed carrier ranking** in the database with your company designed as a red star. The weighed ranking means that the percentage of reported ships of the totally owned fleet is multiplied with the total score. By putting the pointer on the different (unnamed) carriers you will see their total weighed score.

If you go down the page to Ranking and enter the orange ranking figures by the type of ship, the top chart will update to show the weighed ranking for that type of carriers. This is probably the most adequate comparison as the same types of carriers are compared.

Under Vessel Count and reported vessels you may enter **view vessel ranking**. This is the same page as **list of vessels** mentioned above

## STATISTICS

Under the **Statistics/ Search** function you may search the database for your own ships by adding constraints as routes, type of vessel, owned chartered, verified and environmental management systems.

Under the **Statistics/ Mean Comparison** function you can compare the mean values for all your vessels compared to all other vessels in the database of the same type and on the same route. Your vessel is in that case not included in the mean values of the database.

Under the **Statistics/ Vessel ranking** you enter the same page as **list of vessel** and **view vessel ranking** mentioned above.

## **GUIDANCE FOR CARGO OWNERS**

When you logged in with your username and password you will come to the **Welcome page**. Please read through this so all circumstances are clear!

**Statistics/ Carrier ranking** in the left column of the page is the natural entering. Here you will see the general ranking of all carriers in the Index based on the total weighed score. The total weighed score refers to the total mean score *multiplied* with the ratio of reported ships to the database to the totally owned/managed vessels (or if that figure is missing, to the totally operated ships).

Note that all the scoring on CO<sub>2</sub> and SO<sub>x</sub>&PM from the first index version is nullified due to an enhanced scoring system.

A blue colouring is indicating how well the carrier performs environmentally going from dark with low performance to very light with good performance. These colours are not connected with the Clean Shipping Recommendation colours but are used mainly for illustrative purposes.

If you want to rank the carriers according to some specific environmental field you may click on some of the orange headlines on the top of the table like **CO<sub>2</sub>** or **Chemicals**. This is however not a weighed ranking according to reported ships.

Of more interest is maybe the ranking by carrier type. If you select for example container carrier type in the drop down menu on the top of the page, you will get a total weighed ranking of for container carriers in the ranking table. This may be done for all carrier types in the menu.

If you enter on a certain carrier (click on the orange name) you will come to the carrier information page. This information the carrier has filled in and can also see. On the top of the page you may enter the **list of vessels** for this carrier. Here all the ships of this carrier are ranked and detailed information on each vessel is found. We will come back to that further down.

A chart is showing at the top of the carrier information page. This is presenting the **total weighed carrier ranking** in the database with the actual carrier designed as a red star. The weighed ranking means that the percentage of reported ships of the totally owned fleet is multiplied with the total score. By putting the pointer on the different (unnamed) carriers you will see their total weighed score.

To get the group ranking for one type of carrier, you may go down the page to Ranking and click on the orange ranking figures by the type of ship, for example container. The top chart now updates to show the weighed ranking for this type of carriers.

The coloured field below the chart represents the Clean Shipping performance levels. The performance levels are defined in the field, but in more detail in the Clean Shipping Recommendations chapter below. By putting the pointer on the coloured field, reported vessels and total weighed scores will also show.

To view the detailed information on vessels you go back to the top of the carrier information page and click on **list of vessels**. You will find a ranking of the vessels by total score (of course these are not weighed by number of reported ships). Just as for the carrier ranking you may select a ranking based on one of the five fields by clicking on the orange headlines for example **CO<sub>2</sub>** or **Chemicals**. You can also select ranking of type of vessels in a drop down menu, if it happens that the carrier operates different types of ships.

By clicking on an orange IMO number you will find the information on that specific ship – the **vessel information** page. At the top a spider diagram is showing the five different environmental areas and the scores for this specific ship. Putting the pointer on the different breaking points in the diagram will show the score percentage the carrier has reached in these different areas for the ship.

The total score will be shown by putting the pointer on the coloured performance field below. The performance levels are defined in the field but in more detail in the Clean Shipping Recommendations chapter below.

Under Routes at the bottom of the page you may enter **view in chart**. In the spider diagram at the top an orange line now will show the mean values for *all* vessels of the same type in the database on that specific route - this ship's values excluded.

To see all the detailed information presented on the ship you may enter **view questionnaire** at the absolute bottom of the page.

**Statistics/Search** in the left column is a very useful function to select information from the database. Entering this page you will find a number of parameters that you may design a search. The six parameters *Carrier, Route, Type of Vessel, Owned or chartered, Index verified by /Environmental Management System*, may all be used single or in any combination to find what you want. The selection may be entered in a **Result set**.

A selection of for example of tankers on certain route may be added to the Result set. **Search Results** is now showing on top of the left column. Here you may now perform a **Carrier comparison, Carrier ranking** and a **Vessel ranking** on this selection. The ranking may also be performed on single parameters like for example CO<sub>2</sub> or chemicals. You may for instance find the best performing vessel and the best performing carrier when it comes to CO<sub>2</sub> emissions on this route. You may find the best performing ship in the whole database when it comes to chemicals etc.etc.

**Statistics/ Mean comparison.** This function, in the left column, allow you to select a *carrier, type of vessel and route* and compare the mean values to the whole database. In this case the mean values of the compared vessel(s) are not included in the database mean values.

**Finally** it is only to play around and learn all functions. There is no danger as everything is blocked. You cannot add or erase anything. Good luck!

## VESSEL SCORING

The scoring system is divided into five areas with a maximum total score of 150 p. The five areas have maximum score of 30 p each, and they are all important to address. However it is difficult to scientifically compare different type of emissions with exact figures. The scoring system may be seen as a tool to estimate how well a vessel is performing in each area. The weighing together of the score gives a hint of the overall performance but must be judged with reason and used as a platform for more detailed discussions in for example a procurement situation.

The score selection is made so there is room for development. Ideally the scoring should not have to be changed over time so a comparison could be done for example between procurement intervals.

### **SOx and PM: 20% of 150p = Max 30p**

SOx/PM main engines (if operating *only* outside or *only* inside ECAs, fill in that option and the value doubles)

|   |   |    |
|---|---|----|
| Operations in non-ECAs and ECAs<br>(total yearly average) | No data   | 0  |
|   | Operation <i>only</i> in ECAs (ECA scoring doubles)       | 0  |
|   | Fuel quality $\geq 2.5\%$ S                               | 0  |
|   | Fuel quality $< 2.5\%$ S                                  | 1  |
|   | Fuel quality $< 2.3\%$ S                                  | 2  |
|   | Fuel quality $< 2.0\%$ S                                  | 3  |
|   | Fuel quality $< 1.5\%$ S                                  | 5  |
|   | Fuel quality $< 1.0\%$ S                                  | 7  |
|   | Fuel quality $< 0.5\%$ S                                  | 9  |
|   | LPG/LNG/Biogas  | 11 |
| Operations in ECAs<br>(yearly average)                    | No data   | 0  |
|   | Operation <i>only</i> in non-ECAs (scoring above doubles) | 0  |
|   | Fuel quality $\geq 1.4\%$ S                               | 0  |
|   | Fuel quality $< 1.4\%$ S                                  | 1  |
|   | Fuel quality $< 1.2\%$ S                                  | 2  |
|   | Fuel quality $< 1.0\%$ S                                  | 3  |
|   | Fuel quality $< 0.8\%$ S                                  | 5  |
|   | Fuel quality $< 0.5\%$ S or MDO $< 1\%$ S                 | 7  |
|   | Fuel quality $< 0.1\%$ S                                  | 9  |
|   | LPG/LNG/Biogas  | 11 |
| SOx/PM aux. engines:                                      | No data   | 0  |
|   | Fuel quality $> 0.1\%$ S                                  | 0  |
|   | Fuel quality $\leq 0.1\%$ S – included use in boilers     | 6  |
|   | Shore-side electricity – included use of $\leq 0.1\%$ S   | 8  |
|   | LPG/LNG/Biogas  | 8  |

### **NOx: 20% of 150p = Max 30p**

|                   |  |    |
|-------------------|--|----|
| NOx main engines: | No data  | 0  |
|                   | Engines 2000-2011, above or within Tier 1 levels                     | 0  |
|                   | Engines prior year 2000, Tier I levels                               | 6  |
|                   | Engines prior year 2011, Tier II levels                              | 9  |
|                   | $\geq 40\%$ below Tier I levels                                      | 15 |
|                   | Tier III levels  | 21 |
| NOx aux. engines: | No data  | 0  |
|                   | Engines 2000-2011, above or within Tier 1 levels                     | 0  |
|                   | Engines prior year 2000, Tier I levels                               | 2  |
|                   | Engines prior year 2011, Tier II levels                              | 3  |
|                   | $\geq 40\%$ below Tier I levels                                      | 6  |
|                   | Tier III levels or when shore-side electricity is installed and used | 9  |

**CO<sub>2</sub>: 20% of 150p = Max 30p**

|                                       |   |    |
|---------------------------------------|---|----|
| CO <sub>2</sub> emission information: | No data   | 0  |
|                                       | CO <sub>2</sub> per TEU-km according to BSR           | 3  |
|                                       | CO <sub>2</sub> per tonne-nm according to MEPC (EEOI) | 3  |
| CO <sub>2</sub> emission performance: | No data   | 0  |
|                                       | Reference value or above                              | 0  |
|                                       | < Reference value                                     | 3  |
|                                       | > 5% below reference                                  | 6  |
|                                       | > 10% below reference                                 | 9  |
|                                       | > 15% below reference                                 | 12 |
|                                       | > 20% below reference                                 | 15 |
|                                       | > 25% below reference                                 | 18 |
|                                       | > 30% below reference                                 | 21 |
| > 35% below reference                 | 24  |    |
| > 40% below reference                 | 27  |    |

**Chemicals: 20% of 150p = Max 30p**

|  |  |   |
|--|--|---|
| Antifouling:   | No data  | 0 |
|  | Other  | 0 |
|  | Controlled depletion polymer (CDP)   | 0 |
|  | Self-polishing coating (SPC), only accept. Biocides)                                       | 3 |
|  | SPC on sides (only acceptable biocides) and non-toxic bottom                               | 5 |
|  | Non-toxic  | 7 |
| Stern tube oil:  | No data  | 0 |
|  | Mineral oil based  | 0 |
|  | Air seal   | 3 |
|  | Based on biodegradable oil   | 5 |
|  | Water lubrication  | 7 |
|  | Not applicable   | 7 |
| External hydraulic fluids:                                     | No data  | 0 |
|  | Mineral oil based  | 0 |
|  | External hydraulics exchanged to electrical power  | 3 |
|  | Based on biodegradable oil   | 3 |
|  | External hydraulic system capped   | 3 |
| Gear oils for thrusters and controllable pitch(CP) propellers: | No data  | 0 |
|  | Mineral oil based  | 0 |
|  | Based on biodegradable oil   | 5 |
|  | Not applicable   | 5 |
| Boiler/ cooling water treatment:                               | No data  | 0 |
|  | Classified as CMR, toxic, sensitizing or dangerous to the environment                      | 0 |
|  | Not classified as above (nitrite exclusive)  | 2 |
| Cleaning agents:   | No data  | 0 |
|  | Classified as CMR, dangerous to the environment or toxic                                   | 0 |
|  | Not classified as above  | 3 |
| Refrigerants:  | No data  | 0 |
|  | Non-natural (excluding the HFCs below)   | 0 |
|  | HFCs complying with GWP < 3500 and ODI = 0   | 1 |
|  | Natural (NH <sub>3</sub> , CO <sub>2</sub> ) or HFCs complying with GWP < 1850 and ODI = 0 | 3 |

**Water and waste control: 20% of 150p = Max 30p**

|                         |   |    |
|-------------------------|---|----|
| Ballast water treatment | No data   | 0  |
|                         | No treatment  | 0  |
|                         | Ballast water mid-ocean exchange  | 3  |
|                         | IMO final approval  | 10 |
|                         | Not applicable  | 10 |
| Sewage/ black water     | No data   | 0  |
|                         | No treatment  | 0  |
|                         | No discharge in sensitive areas (PSSA) or sewage treatment plant onboard  | 3  |
|                         |   |    |
| Garbage handling        | No data   | 0  |
|                         | Incinerator used on board   | 0  |
|                         | Waste overboard   | 0  |
|                         | No incinerator onboard or documented no incineration of garbage <b>and</b> no waste overboard and separate garbage handling for reuse, recycling and disposal | 3  |
|                         |   |    |
| Sludge handling         | No data   | 0  |
|                         | Incinerator used onboard  | 0  |
|                         | No incinerator onboard or documentation of no incineration of sludge and disposal of sludge to treatment on shore   | 4  |
|                         |   |    |
| Bilge water treatment   | No data   | 0  |
|                         | Gravimetric separation  | 0  |
|                         | Active treatment installed and < 5ppm oil in outgoing water   | 5  |
|                         | Active treatment installed and < 5ppm oil in outgoing water <b>and</b> emission control box in place  | 7  |
|                         |   |    |
| Crew awareness          | No data   | 0  |
|                         | Documented education of personnel on environmental awareness, health risks and adequate protective equipment  | 3  |
|                         |   |    |

## CLEAN SHIPPING RECOMMENDATIONS

Using this database as a tool for selecting environmentally enhanced vessels and carriers, it is up to the cargo owner to set the criteria on how the selection shall be performed. However the Clean Shipping Project would like to give some recommendations defining three levels of environmental performance in the colours of red (“low performance”), yellow (“medium performance”) and green (“good performance”).

In the database the colours are showed both on carrier basis and on vessel basis. They could exist separately so for example a “green” carrier does not have to have only “green” vessels. The green or good performance would refer to carriers with at least 90% of the vessels reported, the carrier verified and the total weighed scoring 40% or above. The yellow carriers with medium performance are those with at least 10% in total weighed score and reporting at least 20% of their owned/managed fleet. The red or low performance are those with total weighed score less than 10% or reporting less than 20% of their owned/managed fleet.

Transferring the recommendation colours to vessels, the green would refer to vessels with verified information and scoring at least 50% in total, at least 35% in all five major fields and scoring in all subgroups under Chemicals and Waste & Water. The yellow would refer to vessels scoring at least 20% total score and the red would refer to vessels scoring below 20%.

This could be summarized in a table:

|               | Carriers   | Vessels   |
|---------------|--|---|
| <b>GREEN</b>  | ≥90 % vessels reported, the carrier verified,<br>≥ 40% weighed total score | The vessel verified, total score ≥ 50%,<br>≥ 35% score in all five fields, scoring<br>in all subgroups under Chemicals and<br>Waste & Water |
| <b>YELLOW</b> | ≥ 20% vessels reported<br>≥ 10% weighed total score                        | Total score ≥ 20%   |
| <b>RED</b>    | < 20% vessels reported or,<br>< 10% weighed total score                    | Total score < 20%   |

## **REFERENCES**

- (1) IMO. 1998. *Protocol of 1997 to amend MARPOL 73/78. Annex VI of MARPOL 73/78. Regulations for the Prevention of Air Pollution from Ships*. London. 1998.
- (2) ISO/IEC Guide 65. 1996 (EN 45011:1998). *General requirements for bodies operating product certification systems*.
- (3) MEPC. 2009. *Guidelines for voluntary use of the ship energy efficiency operational indicator (EEOI)*: MEPC.1/Circ. 684. 17 August 2009. [www.imo.org](http://www.imo.org) ([www.imo.org/includes/blastData.asp/doc\\_id=11788/684.pdf](http://www.imo.org/includes/blastData.asp/doc_id=11788/684.pdf))
- (4) BSR. 2008. *Clean Cargo Working Group. Environmental Performance Survey 2008*. [www.bsr.org](http://www.bsr.org) . See also Appendix 1.
- (5) Norwegian Maritime Directorate. 2008. *Guideline on the NOx tax*. [www.sjofartsdir.no](http://www.sjofartsdir.no)
- (6) MEPC. 2008. *Revised MARPOL Annex VI. Amendments to the Annex of the Protocol of 1997 to amend the international Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto*. MEPC 176 (58). [www.imo.org](http://www.imo.org)
- (7) Swedish National Maritime Administration. 2008. *National nitrogen oxide reduction attestation (NOx-reduction attestation) issued by an accredited control laboratory in accordance with The National Maritime Administration´s decrees (SJÖFS 2004:26) with regulations concerning fairway dues and (SJÖFS 2004:27) with regulations concerning conditions for environmental differentiated fairway dues*. [www.sjofartsverket.se](http://www.sjofartsverket.se)
- (8) Directorate of Customs and Excise. 2008. *Tax on emissions of NOx 2008*. Circular No. 14/2008 S, Oslo. [www.toll.no](http://www.toll.no)
- (9) MEPC. 2008. *Prevention of Air Pollution from Ships*. MEPC 58/INF.6 [www.imo.org](http://www.imo.org)
- (10) EU. 1998. *Directive 98/8/EC of the European Parliament and of the Council of 16 February 1998 concerning the placing of biocidal products on the market*.
- (11) ISO 9439:1999. *Water quality – Evaluation of ultimate aerobic biodegradability of organic compounds in aqueous medium – Carbon dioxide evolution test*.
- (12) ISO 10708:1997. *Water quality – Evaluation in an aqueous medium of the ultimate aerobic biodegradability of organic compounds – Determination of biochemical oxygen demand in a two-phase closed bottle test*.
- (13) ISO 9404:1999. *Water quality – Evaluation of ultimate aerobic biodegradability of organic compounds in aqueous medium by determination of oxygen demand in a closed respirometer*.
- (14) EU. 1967. *Council Directive 67/548/EEC of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances*.
- (15) EU. 2004. *Regulation (EC) No 648/2004 of the European Parliament and of the Council of 31 March 2004 on detergents*.
- (16) Montreal. 1987. *The Montreal Protocol on Substances that Deplete the Ozone Layer*. <http://ozone.unep.org>
- (17) IMO. 2004. *International Convention for the Control and Management of Ships´ Ballast Water and Sediments*. [www.imo.org](http://www.imo.org)
- (18) MEPC. 2005. *Guidelines for ballast water exchange (G6)*. Resolution MEPC.124 (53). [www.imo.org](http://www.imo.org)
- (19) MEPC. 2008. *Information Reporting on Type Approved Ballast Water Management Systems*. Resolution MEPC. 175 (58). [www.imo.org](http://www.imo.org)
- (20) MEPC. 2006. *Revised guidelines on implementation of effluent standards and performance test for sewage treatment plants*. Resolution MEPC. 159 (55). [www.imo.org](http://www.imo.org)
- (21) MARPOL. 1988. *Annex V; Prevention of Pollution by Garbage from Ships*. [www.imo.org](http://www.imo.org)
- (22) MARPOL. 2007. *Annex I; Prevention of Pollution by Oil* [www.imo.org](http://www.imo.org)
- (23) ISO. 2005. *Petroleum products – Fuels (class F) – Specifications of marine fuels*. ISO 8217:2005(E)

- (24) GHG-WG. 2009. *Considerations of the energy efficiency design index for new ships. Recalculation of energy efficiency design index baselines for cargo ships.* IMO GHG-WG 2/2/7. 4 Feb. 2009.
- (25) NTM. 2009. *NTM cargo group estimation of capacity utilisation.* Nätverket för Transport och Miljö. [www.ntm.se](http://www.ntm.se)
- (26) BSR. 2009. *Information mail from the Clean Cargo Working Group,* Business for Social Responsibility, USA; att Raj Sapru, [rsapru@bsr.org](mailto:rsapru@bsr.org) by the 15<sup>th</sup> of September 2009.
- (27) ICCT. 2007. *Air Pollution and Greenhouse Gas Emissions from Ocean-going Ships.* The International Council on Clean Transportation. March 2007. [www.theicct.org](http://www.theicct.org)

## **Appendix 1: Clean Cargo Working Group Metric for CO2**