Öhrlings

PRICEWATERHOUSECOOPERS

Emissions Trading Scheme SO_2 & NO_x

Swedish Shipowners´ Association's response to:
Discussion Paper
"A COMMUNITY STRATEGY ON AIR POLLUTION FROM SEAGOING SHIPS"

Gothenburg 26.02.2002

Öhrlings

PRICEWATERHOUSECOOPERS

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1 Summary

1.1 Introduction

The Swedish Shipowners´ Association (SSA) would like to submit a response to the "Community Strategy on Air Pollution from Seagoing Ships". We are convinced there are possibilities to obtain more substantial emissions reductions, at a shorter time horizon, and to a lower cost by using market driven mechanisms. These methods are relatively new to Europe but have been successfully implemented in North America[1].

We agree about the magnitude of the problem regarding emissions from ships and we therefore find it important to take our responsibility and suggest a model for reductions that would be useful for society as a whole by encouraging reductions not only at sea but also from land-based sources.

The SSA has developed this proposal partly in cooperation with the Swedish Maritime Administration. We have also been encouraged to form this proposal following a meeting with KIMO[2], and the discussion related to the forthcoming Nordic environmental ministers meeting 20-26 March 2002, where they articulate the interest in developing solutions based on new mechanisms in order to find economic incentives to reduce emissions from ships in the North Sea. We have worked with a specialist consultancy agency, PricewaterhouseCoopers, and have together achieved encouraging results following an analysis of the possibilities to introduce an emissions trading system. In a quick and cost-efficient way the system would achieve significant adaptation of the European maritime transport industry and thereby help and support achieving the overall aims for emission reductions.

1.2 The model for emissions trading of SO_2 & NO_x

Previous and current experiences of emissions trading in North America have been very successful, in particular, the SO_2 allowance trading. Reductions in emissions have surpassed environmental targets. Companies participating in the trading schemes have been able to adopt the most cost-effective strategies to reduce emissions. The outcome for the environment and society as a whole has, therefore, fulfilled expectations.

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[1] US Environmental Protection Agency (EPA), http://www.epa.gov/airmarkets/; and Swift, Byron, "Allowance Trading and Potential Hot Spots - Good News from the Acid Rain Program" 31 Environment Reporter, pp. 954-959, May 12, 2000. (31 KB PDF File) (Copyright 2000 by The Bureau of National Affairs, Inc.); and EPA's Acid Rain Program: Results of Phase I Outlook for Phase II, October 2001, Clean Air Markets Division, EPA. EPA430-F-01-022; and Krolewski, Mary Jo, and Andrew S. Mingst, "Recent NOx Reduction Efforts: An Overview." March, 2000

[2] Kommunenes Internasjonale Miljøorganisasjon: Local Authorities International Environmental Organisation, http://www.zetnet.co.uk/coms/kimo

In view of this, the Swedish Shipowners' Association (SSA) proposes an emission trading system as a financial incentive for the reduction of SO_2 and NO_x emissions, where the shipping industry will participate in the trading on a voluntary basis.

The trading scheme includes both land based emitters and emissions from ships. Only land based, heavy emitters will be subject to capping. Through the introduction of a trading scheme, the capped emitters will be able to choose between a number of different options in order to meet future emission targets. The model describes the manner in which emission reductions from the shipping industry should be managed in order to create credits for sale. In addition, the model can be further developed to allow other sectors to participate.

The shipping industry will be able to lower its emissions substantially, at a comparably low cost. The trading scheme will motivate ship-owners to make the necessary investments in order to achieve emissions reductions. The capped land based utilities will be given the opportunity to manage a portion of their emissions restrictions through trading, and reductions will then be made, where investments are most cost and environmentally effective. One conclusion drawn from previous experience of trading is that the possibility of financial gains is a far more efficient measure for stimulating emissions reductions than regulations or economic sanctions, such as charges or taxes.

A voluntary trading system provides the opportunity to involve all ships sailing in the EC region, including significant transit traffic, i.e. Russia, Norway and candidate EC countries. A regulatory approach for managing the emissions might result in the maritime transport operators choosing ports outside the EC. Consequently the EC ports would face a competitive disadvantage that might lead to loss of business.

1.3 Background to the model

The SSA has chosen to propose a model for the trading of SO_2 and NO_x emissions reductions for several reasons. Firstly, the regulatory approach on the shipping industry has, until now, not been very successful. The Marpol 73/78 Annex VI[3] has not yet been ratified, and the proposed 1,5% demand on sulphur content in fuel would not be sufficient to obtain necessary environmental impact.

Secondly, the international Conventions of maritime law (UNCLOS)[4] prevent the implementation of local or regional rules. Consequently, the trading scheme will function on a voluntary basis for the shipping industry.

[3] International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78), http://www.imo.org/
[4] United Nations Convention on the Law of the Sea, http://www.unclos.com

Thirdly, levying taxes and charges on shipping might constrain the use of maritime transport within the EC region and, might result in, ship-owners finding alternative solutions in order to avoid any disadvantage in terms of competition.

Sweden has had positive experience of emissions reductions through differentiated fairway dues[5]. A similar system would, however, be difficult to implement throughout Europe due to different charging systems in ports. The system in Sweden has also been voluntary based, which has proven to be very effective. Systems for monitoring and verifying have fulfilled the Swedish requirements, and could also be used in the proposed emissions trading scheme. Nevertheless, due to the continuous development in the area of monitoring, we believe there will be new techniques available when launching the trading system. Additionally, we would like to stress the importance of a reliable system with sufficient assurance level, in order to secure the value of the reduction.

The model should be regarded as a complement to the IPPC Directive[6]. The trading scheme includes caps on the utilities covered by this Directive. The Directive 2001/80,[7] regarding emissions from Large Combustion Plants (LCP), should also be taken into account when establishing the caps. The model assumes that utilities included in the Directives are given the opportunity to manage some part of their reductions through trading. The trading scheme should also be considered a complement to Directive 2001/81[8], regarding National Emissions Ceilings, and Directive 1999/32[9], regarding the Sulphur Content of Liquid Fuels.

According to the ECCP (European Climate Change Programme)[10] and the Commission's White Paper, "European Transport Policy for 2010"[11], the EC wants to stimulate a modal shift in transports. The SSA fully supports this policy.

An anticipated increase in maritime transport may, however, result in increased SO_2 and NO_x emissions. As a result, there is a greater demand for an efficient tool to manage the higher levels of emissions. In order to be able to avoid taxes and charges on the shipping

[5] Swedish Maritime Administration, http://www.sjofartsverket.se , SJÖFS 1998:13
[6] Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control, Official Journal L 257 , 10/10/1996 p. 0026 - 0040
[7] Directive 2001/80/EC of the European Parliament and of the Council of 23 October 2001 on the limitation of emissions of certain pollutants into the air from large combustion plants, Official Journal L 309 , 27/11/2001 P. 0001 - 0021
[8] Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants, Official Journal L 309, 27/11/2001 P. 0022 - 0030
[9] Council Directive 1999/32/EC of 26 April 1999 relating to a reduction in the sulphur content of certain liquid fuels and amending Directive 93/12/EEC, Official Journal L 121 , 11/05/1999 P. 0013 - 0018
[10] COM(2001) 580 final,COMMUNICATION FROM THE COMMISSION on the implementation of the first phase of the European Climate Change Programme (ECCP), Brussels, 23.10.2001
[11] COM(2001) 370, WHITE PAPER - European transport policy for 2010: time to decide, Brussels, 12/09/2001

industry, which could constrain the development of the modal shift, a trading scheme should be implemented. This would be a more efficient measure of obtaining substantial reductions in emissions, at a low cost, throughout the EC.

The SSA is aware of the need of further investigation in some areas connected to the model, for example verification and marketplace functions.

1.4 CO_2 emissions

The SSA anticipates that the IMO (International Maritime Organization) will continue to deal with the issue of reductions of CO_2 emissions from shipping.

Furthermore, we believe that by implementing market based financial incentives, the shipping industry will be encouraged to further reduce CO_2 emissions. In view of this, we recommend a voluntary solution based on trading to reduce CO_2 levels for the shipping industry.

1.5 VOC emissions

Regarding VOC emissions we agree that they are also an environmental problem. The principal contributors to this are fuelling docks. The solution is to install vapour return lines. This is the foundation for reductions of VOC. Voluntary systems appear to be the most effective way of reducing offshore VOC emissions. For example, inspiration could be drawn from Intertanko's VOCON procedures[12] with regard to tanker transportation.

[12] http://www.intertanko.com

2 Emissions Trading Scheme SO_2 & NO_x

2.1 Introduction

We propose a SO_2 and NO_x emission trading system throughout the EC as one of the main components of the common European efforts to prevent negative environmental impacts of SO_2 and NO_x. The scope of the system is to reduce the emissions in the most cost-effective manner for society as a whole. In this chapter we make a general outline of the proposal.

In order to achieve functional trading, a cap (emission budget) must be placed on some parts of the European industry sector, we suggest, the utilities covered by the IPPC Directive. The use of the system will allow utilities to adopt the most cost-effective strategy for the reduction of their SO_2 and NO_x emissions, for example, by purchasing emission allowances or emission reductions credits or by investing in abatement projects and/or technology.

The proposed system includes the possibility of selling emission reduction credits (ERC) through the trading system as an economic incentive for sectors not covered by a cap, in order to reduce their NO_x and SO_2 emissions. The model is focused on shipping industry as creator of ERC:s, however, it could be further developed to include other sectors.

Our proposed EC market-based allowance and credit trading system is, in many respects, centred on experiences and ideas from the US Acid Rain Program with the SO_2 allowance trading component (in action since 1995)[13], as well as various US NO_x trading schemes (OTC, SIP Call)[14] and the planned "cap, credit and trade" system of SO_2 and NO_x in Ontario, Canada (to be launched during 2002)[15].

The emissions resulting from the implementation of both the US SO_2 allowance trading system and the Ozone Transport Commission (OTC) NO_x Budget Program, have been significantly lower than the actual cap. Furthermore, costs have been even lower than anticipated.[16]

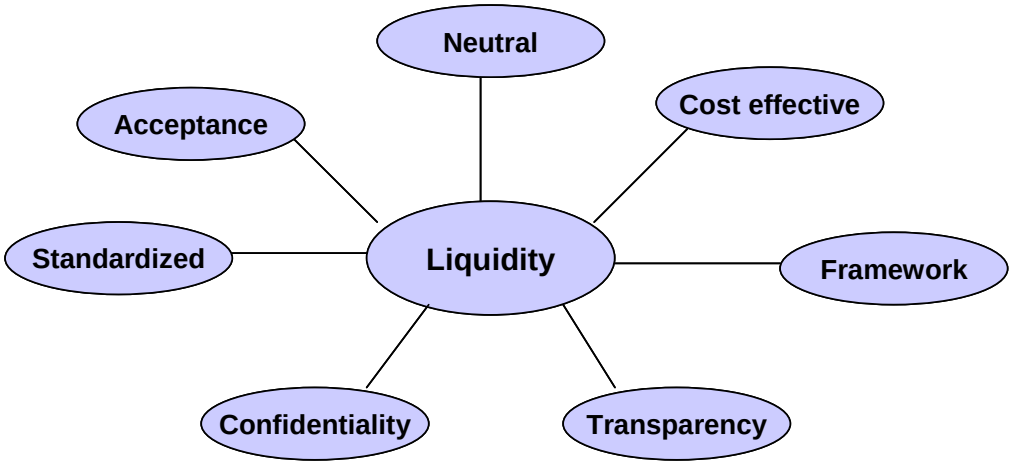
[13] US Environmental Protection Agency (EPA), http://www.epa.gov/airmarkets/
[14] US EPA (http://www.epa.gov/airmarkets/), Natsource (http://www.natsource.com), Evolution Markets (http://www.evomarkets.com) and Cantor Fitzgerald's Environmental Brokerage Services (http://www.cantor.com/ebs.html)
[15] Ontario Ministry of Environment (http://www.ene.gov.on.ca), Environmental Finance Vol 3, No 2, p5 and Environmental Finance Vol 2, No 7, p22-23
[16] US EPA, http://www.epa.gov/airmarkets/

2.2 General conditions for trading

The proposed model for emissions trading assumes an institutionalised market place. An exchange will ensure a cost effective solution and general accepted rules for trading. The main advantages of an exchange are the centralised clearing, the counterpart risk and the transparency. A counterpart exchange is probably preferable as the counterpart risk is eliminated, although there may be a need for margin calls for outstanding trades.

The trading will depend on trust in the system, that is, it should be clear that the rules, liquidity and products on the exchange will not change in a foreseeable future. If not the traders, speculators and arbitrators will have such trust in the market they will not invest and these actors are necessary for the liquidity of the market. Additionally, the standardisation of the products is important, especially over time. A right purchased today should be the same as one purchased in a year, or have a set future value. One of the most important aspects of an exchange is that the framework ensures transparency.[17]

Figure 1: Requirements for an institutionalised market place. Source: PricewaterhouseCoopers



2.3 Bodies and players in the system

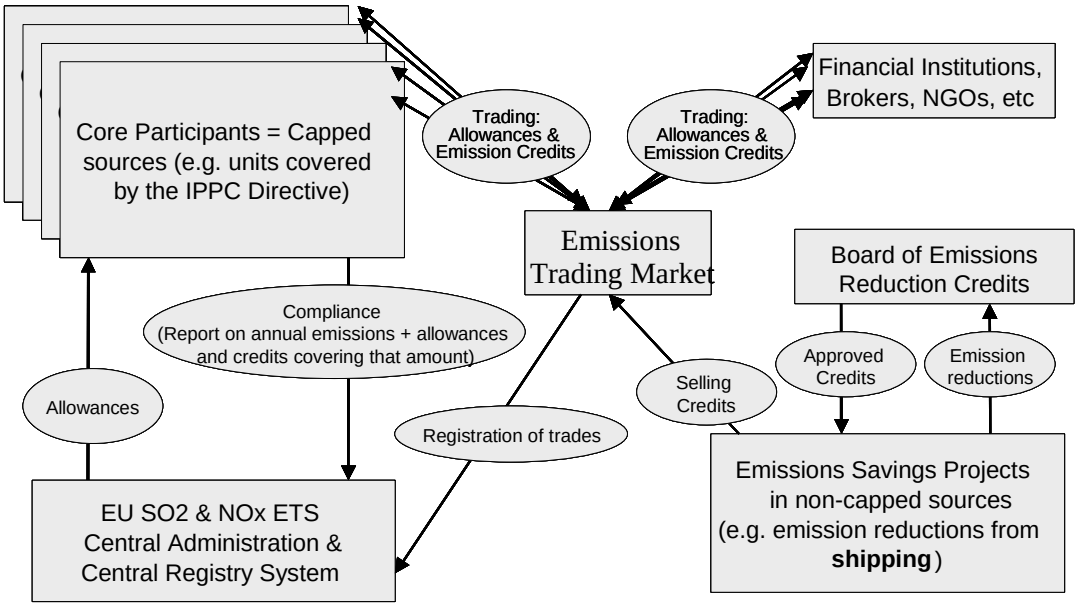
We propose that a Central Administration of the trading system develop and maintain regulation and guidelines for the system. Regulation and guidelines should cover all aspects of the system. Important departments of the Central Administration are the Central Registry System (that keeps track of all allowances and credits) and the Board of

[17] Source: Financial Risk Management, Global Risk Management Solutions, PricewaterhouseCoopers AB

Emissions Reduction Credits (that develop guidelines for, and approves, emission reduction credits).

The players we see in the system are the capped sources (allowances), the non-capped sources participating through voluntary emissions reductions and the speculators such as financial institutions, brokers etc.

Figure 2: General model of proposed trading scheme



2.4 Trading territory

The proposed coverage of the trading system is within the borders of the European Community (currently 15 countries). When new member States join the EC they should be incorporated into the trading system.

There are arguments against having one single trading territory all across the EC, since acidification is a regional (and in some cases local) environmental problem and ground-level ozone exposure (NO_x is a contributing factor to this problem) is a local and regional problem (see Annex 1 - Environmental issues). Our view, however, is that the demand for the launch and assessment of a single trading system is, at this instance of overall greater importance than considerations for possible local and regional repercussions. If it transpires that the EC wide trading system does not satisfy the regional and local environmental objectives as a result of predominant weather and wind conditions and

variations in ground geology etc, then this should be taken into consideration in due course. We are of the opinion that the use of National Emission Ceilings[18] and local Environmental Quality Standards[19] should ensure that regional and local objectives are fulfilled (See below paragraph "Maximum emission levels of capped sources")

2.5 Cap/Emission Budget

We suggest that the cap/emission budget for SO_2 and NO_x, embrace the emission sources covered by the IPPC Directive, as they are responsible for a major part of the European industry sector's SO_2 and NO_x emissions. The sources are listed in Annex 2 of the Directive. The units covered by the LCP Directive are a subset of the ones covered by the IPPC Directive, and consequently also covered by the cap.

Through the IPPC Directive, the authorities concerned have already made demands on the plants/units, in terms of limits on emissions values[20], environmental quality standards, permits, emissions controls, BAT (Best Available Technology)[21] and reporting. In order to allow the emission sources some degree of freedom in trading, the IPPC Directive would, most likely, require modification for the future, for example, by allocating limited portions of allowances rather than demanding BAT and emission limit values, so long as the environmental quality standards are not exceeded. The LCP Directive sets parallel emission limit values and other demands on the large combustion plants, but does not involve the request for best available techniques (BAT). In many cases BAT involve more stringent conditions than the demands of the LCP Directive.

As an alterative, a cap/emissions budget could be put on the power plants/units not covered by the IPPC Directive. This would permit the trading scheme to get started. The Directive does not cover power plants with less than 50 MW thermal in-put. In a second stage when the IPPC is amended the IPPC sources could be integrated in the cap/trading system.

The aim of the trading system proposal is to create equal, or even larger, emission reductions than those proposed in current policies and regulations, at a lower economic cost. Consequently, in order to create a scope for trading, the levels of the EC SO_2 and

[18] Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants, Official Journal L 309, 27/11/2001 P. 0022 - 0030
[19] Definition from the IPPC Directive 96/61/EC: "Environmental quality standard shall mean the set of requirements which must be fulfilled at a given time by a given environment or particular part thereof, as set out in Community legislation"
[20] Definition from the IPPC Directive 96/61/EC: "Emission limit values shall mean the mass, expressed in terms of certain specific parameters, concentration and/or level of an emission, which may not be exceeded during one or more periods of time."
[21] Definition from the IPPC Directive 96/61/EC: "Best available techniques shall mean the most effective and advanced stage in the development of activities and their methods of operation to reduce emissions and the impact on the environment as a whole"

NO_x cap should be equally, or more stringent than the environmental objectives already set (e.g. the Commission's National Emission Ceilings and the emission ceilings in the UN-ECE Convention on Long-range Transboundary Air Pollution protocol[22]). A certain degree of flexibility in the national emissions ceilings in EC countries may need to be tolerated so long as the EC's overall objective is reached. The emission trading between EC countries could, otherwise, become constrained (for further reasoning see paragraph 2.10 Regulation below). One solution to this problem is to wait with the large-scale trading scheme until 2010.

The levels of the EC SO_2 and NO_x cap should, preferably, be set to cover a fairly long time period (5 years) and these levels should gradually decrease to the emission levels determined by the European Commission. By knowing how the cap level will change over time, the capped utilities can prepare long term and cost-effective emission reduction strategies.

2.6 Allowances

2.6.1 Definition and function

One SO_2 or NO_x allowance in the trading system authorises a capped source to emit a certain quantity of SO_2 or NO_x respectively during a given year (or any year thereafter). Allowances cannot be used for compliance prior to the calendar year for which they are allocated, but banking[23] of surplus allowances will be admitted. Some limits to banking might be needed in order to mitigate the risk for future peak loads. Eventual limits on banking are no obstruction on the market as long as the rules are very clear.

2.6.2 Distribution of Allowances

We suggest that the allowances are allocated to the capped sources by "Grandfathering"[24]. This would be the main allocation principle in order not to impose any additional costs on the capped sources. Allocation could be based on a representative baseline year, calculated as the average of a certain number of years (e.g. three or five), prior to the launching date of the emission trading system. We also suggest that the allocation principle, in addition to emissions during a baseline year, be centred on emission efficiency rates, investment in BAT prior to baseline years, earlier emission mitigation actions etc, in order to prevent disadvantages for early movers and unfair

[22] Convention on Long-range Transboundary Air Pollution, The 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozon, http://www.unece.org/env/lrtap/

[23] Emission allowances and credits not used in one commitment period can be saved or "banked" for future use in a subsequent compliance period.

[24] Grandfathering is a method for issuing emission allowances to emitters and firms in an emission trading scheme according to their historical emissions. This method of allocation may be combined with auctioning. European Climate Change Program, Working Group 1: Flexible mechanisms, Chairman's Background Document No 2; Subject: Allocation Methodologies and Early Action, Brussels 7 December 2000.

advantages to sources with poor emissions reduction equipment and low emissions efficiency rates. Allocation principle must also take the National Emissions Ceilings into consideration. The Central Administration of the trading system should develop the allocation principles.

Each year, a small number of allowances could be held by the System Administration to be auctioned to industry start-ups, which are covered by the cap.

Once the allowances are allocated they are tradable in the emission trading system.

2.7 Emission reduction credits

In addition to allowances, we propose that emissions reduction credits (ERC:s) should be tradable within the system. The tradable emissions reduction credit (ERC) is a cornerstone of the proposed trading system. We suggest an approach where an official committee (Board of ERC:s) is set up to develop general guidelines for the emissions reduction projects. The guidelines should cover rules for determination of baseline, calculation of credits, verification etc. The Board of ERC:s should also function as a supervisor of the credit creating part of the system.

The ERC:s are created in emissions reduction projects performed by companies or sources not covered by the cap. One such source is shipping.

The process of creating marketable credits involves several steps;

1. Reduction of emissions
2. Monitoring of emissions
3. Calculation and determination of reductions
4. Verification of emission reductions
5. Approval of the verified emission reductions as credits by the Board of ERC:s

Once the credit is created and transferred into the account it is tradable in the emission trading system.

The specific process of creating of emissions reduction credits in shipping will be described in chapter 3 “How to create verified Emission Reduction Credits”

2.7.1 Definition and function

Once within the trading system the emissions reduction credit shall have the same value and function as an allowance. That is, one SO_2 and NO_x emissions reduction credit authorises a capped source to emit a certain degree of SO_2 and NO_x during a given year or any year thereafter. Credits cannot be used for compliance prior to the calendar year for which they are created, but banking of credits will be admitted. As for allowances, some limits to banking might be needed in order to mitigate the risk for future peak loads.

However, eventual limits on banking are no obstruction on the market as long as the rules are very clear.

2.8 Trading and liquidity of the system

In order to enhance the market and ensure liquidity, trading could also include others than capped companies. Any corporation, financial institution, broker, municipality, environmental group, etc could be allowed to purchase, sell and trade allowances and reduction credits. In order to maintain some degree of control on the market, an official authorisation may be required in order to trade for the participators. Through this authorisation, the participator would receive an account in the central register system.

The number of capped sources must also be sufficient. By choosing the sources covered by the IPPC Directive, a large number of sources in each member state would be part of the trading system. This should create a sufficient number of capped units. The possibility of creating reduction credits would also enhance the liquidity of the system.

2.8.1 Central register system

In order to keep a record of all allowances and credits created, a central register system (CRS) is required. Each capped source should have several accounts in the system. One account for banking and trading and one account for each vintage year the trading system is run. Other non-capped parties participating in the trading (i.e. credit providers, brokers, financial institutions) should apply to the register system administration for individual accounts[25].. Performed transactions and credits created by projects should be reported in the register system. The CRS could be designed in different ways, preferably through the use of new internet/web solutions. It is important that the design and operation of the program are relatively simple, in order to keep compliance and administrative costs low

2.9 Compliance of capped sources

2.9.1 Monitoring and reporting of capped sources

Complete and consistent emissions measurement and reporting by all sources would guarantee that total emissions do not exceed the cap and that emissions from individual sources are not higher than their allowances and credits held in their account (or eventual local emissions level restrictions determined by local environmental quality standards).

The IPPC Directive with the specified EPER decision[26] requires that countries of the EC report SO_2 and NO_x emissions to the Commission. Consequently already today all the

[25] Proposal of solution is based on existing trading-schemes in the US, see footnote 13,14.
[26] 2000/479/EC: Commission Decision of 17 July 2000 on the implementation of a European pollutant emission register (EPER) according to Article 15 of Council Directive 96/61/EC concerning integrated pollution prevention and control (IPPC) (notified under document number C(2000) 2004) (Text with EEA relevance), Official Journal L 192 , 28/07/2000 p. 0036

IPPC sources need to monitor and report their emissions to the national or local regulatory body. According to the IPPC Directive the permits shall contain ”suitable release monitoring requirements, specifying measurement methodology and frequency, evaluation procedure and an obligation to supply the competent authority with data required for checking compliance with the permit”.

The current reporting could easily be adjusted in order to fit required reporting guidelines, the registry and compliance methodology of the trading system. In our opinion the present monitoring and reporting of the IPPC units would need only marginal modifications.

2.9.2 Verifying reported emissions of capped sources

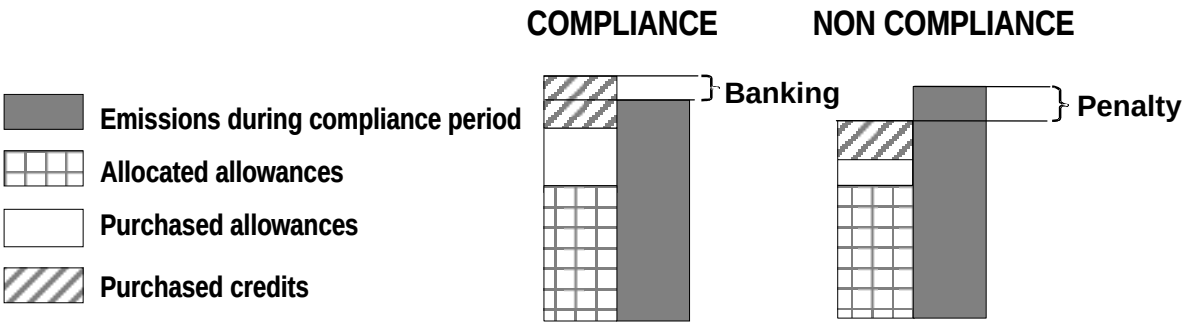
The present reporting of emissions of the IPPC sources does not involve verifying. In the proposed trading system the reliability of reported emissions data from the capped sources is critical to the compliance process and adds credibility to the system. To achieve this, it is important that the reported emissions data are verified. Consequently, it is necessary for the verification to be completed in a consistent, transparent and comparable manner across all capped units. In order to ensure that the reported emissions data are assessed at the same level of assurance the Administration of the trading system should develop common guidelines, based on both financial and environmental audit principles (see Annex 2 - Audit for more discussion regarding levels of assurance). It is important that the costs of verification be at a reasonable level if the cost-efficiency aspect of the system is to be maintained.

2.9.3 End-of-Year Reconciliation

The capped sources are able to utilise both credits and allowances for compliance. Monitored and verified emissions data, as reported by the capped source to the Trading System Administrator, combined with allowance allocations, credits and transfers recorded in the Central Register System, shall provide the basis for the determination of compliance.

After the compliance period of each vintage year (e.g. 1 January to 31 March the subsequent year), the system Administration has reviewed all documentation to justify the actual emissions levels for the previous year, and the corresponding number of allowances and credits are deducted from the unit’s accounts of the completed vintage year. As long as there is a surplus of allowances and credits in the account during the compliance period (compared to the amount of emissions during the previous year) compliance with the trading system rules are secured. Before the accounts of the completed vintage year are closed the units will have the possibility to transfer surplus allowances and credits to the trading and banking accounts.

Figure 3: Compliance and non-compliance



2.9.4 Penalties for non-compliance

If emissions from a capped source exceed the allowances and credits held by the transfer deadline there is a non-compliance situation. The Trading System Administration shall then have the authority to automatically deduct allowances from the budget source's compliance account for the next vintage year. For example, a deduction rate is 3 allowances for every 1 tonne of excess emissions. The entity responsible for the source the following year would either be required to reduce emissions or purchase additional allowances and/or credits in order to make adjustment for the penalty deduction.

In addition to the following suggested penalties, the Commission should enforce provisions pursuant to applicable law and regulations, including those providing for civil and criminal penalties.

2.9.5 Maximum emission levels of capped sources

In order to minimise the risk of negative, local effects from emissions, we suggest that, regardless of the quantity of allowances or credits a capped unit holds, it is never entitled to exceed the limits set in the regional or local environmental quality standards (i.e. this part of the IPPC Directive must be adhered to). Consequently, sources placed in sensitive environments with very stringent environmental quality standards will be allocated more allowances than they are able to use. They will be restricted to mitigation investments and will become net sellers in the trading system.

2.10 Regulation

The IPPC directive, as it functions today, can result in lack of space for trade for the capped sources and difficulties in planning the emission reduction strategies over a longer period. The demand for Best Available Techniques (BAT) will probably make the emissions limits decrease over time in a pace difficult to predict. This could result in that

the units might need to invest in techniques even though they planned compliance through the purchase of allowances and credits. The units will thus become net sellers. Another constraint could be the paragraphs that demand the member states to ensure that all running units have permits 2007 at the latest and that the permits are currently revised for eventual updates. By treating two of the substances (SO_2 and NO_x) differently, the cornerstone of the Directive (the integrated approach) might be considered as jeopardized.

On the other hand the constraints of the IPPC directive could be avoided if the annual cap is set much lower than the average BAT development. However, we propose an amendment of the IPPC Directive in order to be able to implement the emissions trading scheme as a complement to the Directive. Important aspects to be altered are for example emission limits set on longer time horizons and the use of general binding rules instead of individually permit conditions. This would give the utilities the possibility to plan and make strategies for their emissions development more efficiently.

The considerations regarding the Directive on Large Combustions Plants (LCPs) are similar to the ones regarding the IPPC Directive.

The 1999 Gothenburg Protocol of the Convention on Long-range Transboundary Air Pollution (CLRTAP)[27] sets national emission ceilings for 2010 for sulphur and NOx. – The overall EC objectives should of course stand fast or even be tightened. However the national absolute targets for 2010 could limit the trade of allowances and credits between sources in different EC countries. However the deviation from national goals in 2010 should not be great, since it would be unlikely that all sources in one country are net sellers and all sources in another country are net buyers of allowances and credits.

Directive 2001/81/EC on National Emission Ceilings (NECs)[28] also sets national emission ceilings for 2010. In analogy with the considerations regarding the 1999 Gothenburg Protocol of the CLRTAP the national emission ceilings for 2010 could limit the trade of allowances and credits between sources in different EC countries.

However, considering the time needed for planning and implementing an emissions trading scheme of the kind proposed in the model, and the time horizon for the above

[27] United Nations Economic Commission for Europe's (UNECE) Convention on Long-Range Transboundary Air Pollution. The eight protocol of the convention is the "The 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone". The Protocol sets national emission ceilings for 2010 for four pollutants: sulphur, NOx, VOCs and ammonia. More than 30 countries are included in the protocol, for example, Canada, USA and the countries of the EC.
[28] COMMON POSITION (EC) No 51/2000 adopted by the Council on 7 November 2000 with a view to adopting Directive 2000/.../EC of the European Parliament and of the Council of ... on national emission ceilings for certain atmospheric pollutants (2000/C 375/01)

mentioned Directives, the SSA, foresee good possibilities to align the trading scheme with the above mentioned Directives.

3 How to create verified Emission Reduction Credits

This section describes how shipping can create verified emission reduction credits that are marketable in the proposed trading scheme. Contrary to the capped units within the IPPC, shipping does not have any framework that describes how to calculate and report emission reductions which is needed if they are to participate in emissions trading. We also suggest borders for reporting that can be used in the proposed emissions trading system.

The process of creating marketable credits involves several different steps;

1. Reduction of emissions
2. Monitoring of emissions
3. Calculation and determination of reductions
4. Verification of emission reductions
5. Approval of the verified emission reductions as credits by the Board of ERC:s

When the reductions are approved, they are converted into credits, which can enter the market.

3.1 SO_2

3.1.1 Reduction of SO_2 emissions

The SO_2 emissions from mobile sources are dependent upon the sulphur content in the fuel. Theoretically, there are two ways to reduce SO_2 emissions.

1. By purchasing fuel with lower sulphur content, the emission reduction will be proportional to the difference in sulphur content.
2. By introducing an end-of-pipe solution, for example, scrubbing equipment that washes the SO_2 into a liquid phase, the liquid phase need to be collected in order to avoid the problem affecting a different environmental area.

3.1.2 Monitoring of SO_2 emissions

The sulphur content in the fuel must be monitored. The simplest way to achieve this is through the purchasing receipts with verification of the sulphur content. Measuring of the sulphur content in the fuel has to be performed by an accredited measuring laboratory. The classification society[29] could provide this service to obtain assurance of the measuring of the sulphur content. If this is followed by random follow-ups of the ships'

[29] http://www.classification-society.org/

fuel tanks, performed by an independent surveyor, sufficient assurance will be reached. Such a system is used in Sweden when differentiated port and fairway dues are issued[30].

3.1.3 Calculation and determination of SO_2 reductions

To be able to measure an emission reduction, a starting point or baseline must be determined. We recommend that the baseline should be the limit, as set out in the Marpol Annex VI[31], which permits sulphur content of 1,5 % in fuel used in sensitive regions.

The reduction will be the difference between the SO_2 emissions calculated on the basis of the fuel consumption and the baseline (1,5% sulphur). A voyage logbook (to determine where the emission reductions have occurred) will also need to be scrutinised. This type of measurement has proven to be successful in Sweden when differentiated port and fairway dues are issued[32].

3.2 NO_x

3.2.1 Reduction of NO_x emissions

There are two types of NO_x emissions.

1. Air NO_x: the temperature in the combustion engine is sufficient to unite nitrogen gas with oxygen gas and, at certain temperatures, NO_x will be created.
2. Organic nitrogen: sometimes occurs in the fuel and upon combustion, it will be oxidised into NO_x.

It is possible to avoid Air NO_x through optimising the engine's function to attain a temperature where NO_x production does not occur. The engine can also be optimised to work with an air deficit, however this may contribute to other problems such as increased fuel consumption.

The most common way to reduce NO_x emissions is by using some form of end-of-pipe solution. SCR[33] (Selective Catalytic Reduction) technique is most common on ships. A catalytic reaction chamber is installed, which, at sufficient temperature, will reduce NO_x while UREA[34] is injected. The reduction is dependent on several different factors. Engine load is perhaps the most vital factor, as the reactor must be heated to at least 300°C. This will be ensured when engine loads increase.

[30] http://www.sjofartsverket.se, SJÖFS 1998:13
[31] International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78), http://www.imo.org/
[32] http://www.sjofartsverket.se, SJÖFS 1998:13
[33] Exhaust Gas Emissions from Sea Transportation, .TFB Report 1993:1, MariTerm AB and Swedish Transport Research Board
[34] UREA is broken down by the heat in the exhaust gases and then forms ammonia as an intermediary product, then nitrogen gas, water and carbon dioxide is formed instead of nitrogen oxides (Nox).

3.2.2 Monitoring of NO_x emissions

There are a number of different methods that can be used to verify the measurement of NO_x emissions.

Continuous measurement is the only method of taking into account the variations that occur as a result of different engine loads. In performing these measurements as well as conducting an in-depth review of the logbook, the NO_x emissions will be discovered. This method is the most reliable, however, it is also the most complicated. One problem is that all engine pipes should have a measuring installation. This is rather expensive. However, we believe there will be developments within this area, which will facilitate its use and make the process cheaper.

As a more economically viable alternative, we propose issuing a certificate.. A certificate, when compared to energy consumption, could also measure NO_x emissions. An accredited measurement company, will state the ship's NOx emission levels and, thereafter, seal the adjustment parts of the engine, and thereafter issue the certificate. If the reducing technique is dependent of UREA or water consumption then the consumption shall be stated on the issued certificate, the consumption must also be monitored and reported. This type of measurement has proven to be successful in Sweden when differentiate port and fairway dues are issued[35]. The emission levels must be compared to the energy consumption in order to determine the emissions that have occurred. The easiest way of doing this is to study the fuel purchasing receipts to know the quantity and type of fuel and thereby the energy content.

This form of measurement is further described in the "Technical code on control of emission of nitrogen oxides from marine diesel engines".[36] Further investigations will have to take place in order to find the best monitoring solution[37].

3.2.3 Calculation and determination of NO_x reductions

The procedure for emission reduction calculations is as follows:

1. Certificate issued by an accredited measurement company: certification must contain information regarding emission levels at different engine loads.
2. UREA and water consumption must be monitored. (for those techniques that are dependent upon it)
3. Fuel consumption: the certificate will state the ship emissions as g/kWh, in order to get the emissions this will have to be compared with energy consumption.
4. Voyage logbook (to determine where the emissions/reductions have occurred).

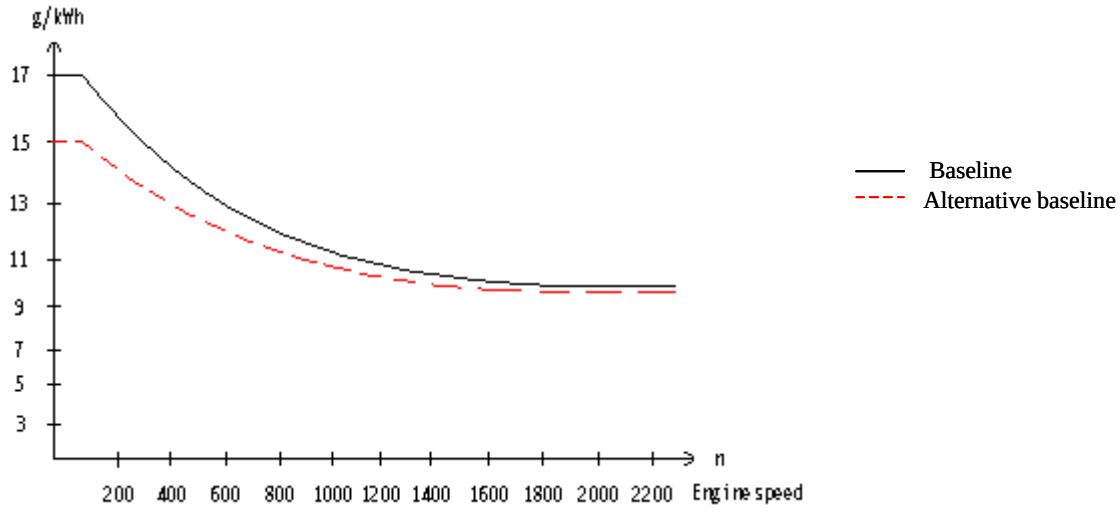
[35] http://www.sjofartsverket.se, SJÖFS 1998:13
[36] Annex VI of Marpol 73/78, Resolution 2, http://www.imo.org or http://www.sjofartsverket.se, SJÖFS 1998:13
[37] The IMO is working on guidelines for on-board NO_x monitoring and recording devices (IMO DE 45/4), which could be the future standard.

5. Verification of the reductions that have taken place in relation to the baseline, described below.

In order to measure the reduction, there must be a baseline from which reductions can be calculated.

We recommend that the baseline be taken from the Marpol Annex VI Chapter 3, Nitrogen oxides emission standards,
$n < 130$ → 17 g/kWh
$130 \leq n < 2000$ → $45 \times n^{-0.2}$ g/kWh
$n \geq 2000$ → 9.8 g/kWh
Where n is rated engine speed (revolutions per minute).

Figure 4: Baseline modified and not modified illustrates the emission levels stated above (adopted from annex VI of Marpol)



The baseline could also be lowered, particularly in the low engine speed area and then function as an alternative baseline (see red dotted line). This type of baseline offers incentives for the majority of vessels with various engine types and is also independent of the applied techniques. A ship with a particular engine speed calculates its baseline and thereafter compares this with its emissions, the difference forms the reduction.

3.3 Verifying reductions

It is very important that the emission reductions are thoroughly verified to ensure the true value of the reductions and credibility on the trading market.

To be able to verify a reduction there must be a framework with guidelines that describes how to calculate and report the emission reductions, this is described in the SO_2 and NO_x sections above and should be further developed by the board of ERC:s. When the emission reductions have been calculated according to the guidelines, the auditor, or third party, can verify the emissions with a certain level of assurance, see Annex 2 - Audit.

3.4 Approval board

We suggest that the Board of ERC:s also functions as a gateway for the emission reductions into the trading market. Documentation regarding the verified emissions reductions are sent to the Board. By showing the settled level of assurance the verified emission reductions are approved as credits by the Board. When the reductions are approved, the Board will put tradable credits (equivalent to the amount of reductions achieved) in the central register account of the project owner.

Once the credit is created in the account it is tradable in the emission trading system.

The Board of ERC:s resembles the Clean Development Mechanism (CDM) Executive Board in the Kyoto agreement, as it also is responsible for supervising and guidelines development of emission reduction projects. PricewaterhouseCoopers is currently working in several projects regarding the design of the CDM Executive Board and the development of CDM audit guidelines[38].

3.5 Penalties for cheating

If emissions reduction credits sold differ considerably from the actual emissions reductions, a penalty must be imposed upon the entity or the juridical person responsible for the credits. In addition to the penalty, the entity must pay a fine to the administrator for the excess credits sold to the emissions trading scheme. The price will be for example 2 times of the higher value of either the selling price or the current market value. The Trading System Administrator should use the money from the fine to purchase allowances or credits and then retire them in order to maintain the cap level, or even lower it.

In addition to the following suggested penalties, the Commission should enforce provisions pursuant to applicable law and regulations, including those providing for civil and criminal penalties.

[38]IETA (International Emissions Trading Association) Working Group“Clean development mechanism (CDM) Audit Protocols and Methods” The Working Group CDM Audit Protocols and Methods”consists of representatives of major attestation service providers internationally, who will be expected to participate in future CDM validation and verification/certification. The group has been set up to review existing guidelines, with the aim of providing comprehensive audit guidance covering validation and verification of CDM projects. Members of the Working Group are: PricewaterhouseCoopers, KPMG, Det Norske Veritas, SGS and TUV Süddeutschland, IETA Memo 25-01-2002

3.6 Borders for reporting

3.6.1 Distances that emissions travel

As the SO_2 and NO_x emissions are inter-regional, regional and sometimes local environmental problems, borders must be established in order to enclose the area in which reductions can be counted for in the form of a credit or a unit. The emissions have a half-life of, 20 hours for SO_2 and 30 hours for NO_x, after this time, 50% of the emissions are still airborne[39]. These conditions imply that the emissions with a wind velocity of 10 m/s could travel between 720 km (SO_2) to 1080 km (NO_x). It has been concluded that a major proportion of the emissions falls on areas of land and that emissions from ships could be considered a cause of acid rain and smog problems on land, if the shipping route is less than 400 nautical miles off shore. Studies show that 60-70% of maritime traffic is found within 200 nautical miles from shore[40].

3.6.2 Existing European borders

There are national territorial borders, which are 12 nautical miles off shore, and the Exclusive Economic Zone (EEZ), which is 200 nautical miles off shore. It is, however, the responsibility of each individual nation to declare the EEZ, which not all nations have done. There are currently no reporting procedures for when ships cross the EEZ borders.

The standard reporting procedure occurs when a ship is 24 hours from the next harbour. This, however, does not apply to the distance from shore and does not cover all ships.

A system called AIS (Automatic Identification System) might be implemented, however, it is limited as the signal carrier is VHF (radio) based and cannot travel further than 12-20 nautical miles. This signal is currently used for information that identifies the ship and information about its cargo. There are discussions concerning whether this information could be carried by a satellite communication system but it has not yet been determined whether this will be developed.

3.6.3 Proposed system for reporting

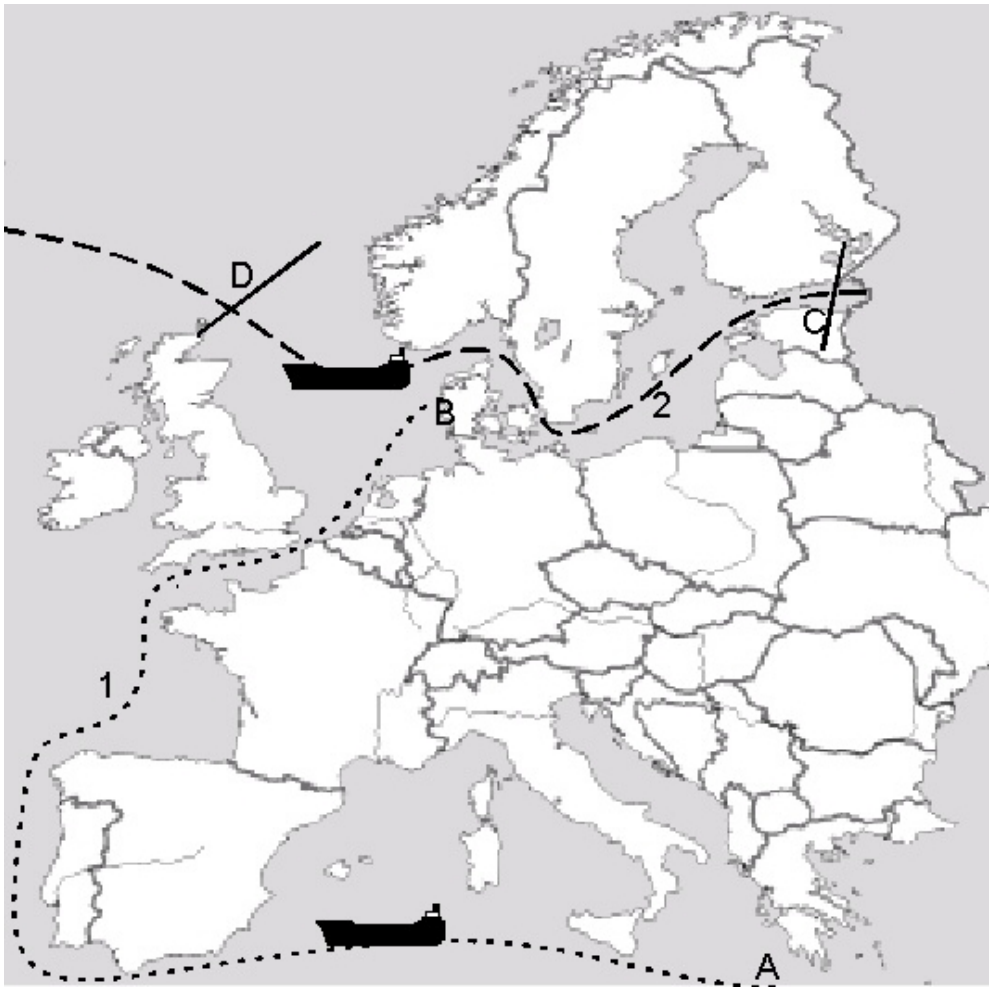
We propose that the borders enclosing the areas in which reductions can be counted as a credit or a unit, will be between European Community ports and also certain pre-established routes through European Community waters.

A possible simplification is to standardise the distances of the different port-to-port and the passing-through routes. This would simplify the process of determining the performed reductions and could also be a way for the transit traffic that pass only through European

[39] NMHI, Norway's Meteorological and Hydrological Institute and Swedish Maritime Administration Memo 2001-10-03 by Stefan Lemieszewski
[40] IMO, International Maritime Organisation and Swedish Maritime Administration Memo 2001-10-03 by Stefan Lemieszewski

Community waters to count their emissions reductions, thereby also giving them an incentive to reduce their emissions levels (See Figure 5).

Figure 5: An example of standardised distances would be route 1 and 2 below. Route 1 will be applied to ships coming from the Suez channel to seek a specific harbour in Denmark, the distance will be calculated in advance. Route 2 is an example of a standardised distance for transit traffic, at C the ship enters EC waters and at D it crosses the EC border for calculating reductions.



The distances will be calculated alternatively as:

1. the shortest possible route between European Community ports;
2. the shortest possible route from or to any European Community harbour, from or to a country outside the EC. Emission reductions can be calculated only according to the distance from the harbour to a designated border line, for example, ships from Gothenburg whose destination is somewhere across the Atlantic Ocean could count their emissions only to a line somewhere between Scotland and Norway;

3. the shortest possible route through European Community waters, for example ships passing through European Community waters from the Atlantic Ocean would start reporting their emissions upon entering the English Channel, and would then use a standardized distance for a destination in the Gulf of Finland, and stop reporting somewhere between Estonia and Finland.

These standardised routes can be continually modified. It may be possible to measure certain routes that are a longer distance from land, as a shorter route, because of their lower environment impact. (See Figure 5)

4 CO_2 emissions

The short-term view of the Swedish Shipowners' Association is that it would be preferable to see how IMO intends to take the CO_2 emissions issue forward, before setting any specific EC policy.

However, in order to motivate ship-owners to reduce their CO_2 emissions, it is crucial to find cost effective, market based financial incentives. We conclude that reductions at sea should have a market value similar to the reductions made within the EU-wide CO_2 trading scheme[41]. This could be achieved either by allowing the shipping industry to participate in the trading by creating ERC:s (Emission reductions credits), or by entitling the transport user to sell reduction credits made at sea, that is, so-called project based reductions. Much depends upon the way in which the bunker fuels, used for international transport, are treated in the climate negotiations of the next commitment period of the Kyoto Protocol, 2012.

To summarize, by implementing market based financial incentives, the shipping industry will be encouraged to further reduce emissions. In view of this , we recommend a voluntary solution based on trading to reduce CO_2 levels for the shipping industry.

[41] Proposal for a framework Directive for greenhouse gas emissions trading within the European Community - COM (2001)581

5 Conclusions

To summarize we would like to emphasize the successful experiences of emissions trading of SO_2 and NO_x in North America. As already mentioned, our model is mainly based on the same structure. This system has proven to be highly efficient regarding environmental targets as well as regarding cost efficiency. The SSA has adapted the structure to also include modal emitting sources, which demands other methods of monitoring. However the methods used in Sweden for differentiated fairway dues has reached satisfying results. Our study shows that it is possible to form a marketplace and solve the need of verification and monitoring.

All details in the model proposed are by obvious reasons, not yet fully developed, there are certain areas, which have to be further investigated, such as the actual market place, verification and possibilities to align with EC Directives concerning land based emitters.

We hope that our proposal will become fruitful input to the Commission, and serve as a basis for alternative strategies to handle emissions from the shipping industry. The SSA is convinced there is a lot of environmental effort that will come forward through a voluntary system, where a market-based approach will motivate proactive ship-owners to handle their emissions. We believe that by implementing our proposed model the goal of emissions reduction will be reached sooner and in a more cost-efficient way.

The Swedish Shipowners´ Association is convinced that the alternative market driven solution described in our model is a better option than taxes or regulation, and therefore we are encouraging further studies in order to clarify the details of the emissions trading scheme.

With respect to emissions of CO_2, the SSA supports the development of the EU-wide trading scheme to include the shipping industry.

Annex 1 - Environmental issues

Climate Change1

European annual mean temperatures have increased by 0.3°C to 0.6°C since 1900. There is increased evidence that most of this warming can be attributed to the emission of greenhouse gases and aerosols by human activities. The most mentioned and important greenhouse gas is carbon dioxide (CO_2).
Warming-up of the atmosphere is part of changes in climate and (extreme) weather conditions. If these changes persist, they will influence water availability, flood hazards, agricultural productivity, and natural areas.

Acidification[42]

Acidification is the process whereby air pollution – mainly ammonia (NH_3), sulphur dioxide (SO_2) and nitrogen oxides (NO_x) – is converted into acid substances.
This 'acid rain' is best known for the damage it causes to forests and lakes. Less well known are the many ways it damages freshwater and coastal ecosystems, soils and even ancient historical monuments, or the heavy metals these acids help release into groundwater.
Sulphur dioxide and the nitrogen oxides are mainly emitted by burning fossil fuels. As some of the reports in this section show, the 1990s saw these emissions drop substantially, thanks to a combination of European Directives forcing the installation of desulphurisation systems, the move away from coal as a fossil fuel, and major economic restructuring in the new German Lander.
Acidification is nevertheless still a major environmental problem in Europe. It is a cross-border issue, requiring coordinated initiatives across countries and sectors. This section brings together the EEA's reports on the scale of the problem and the effectiveness of the solutions tried to date.

Eutrophication[43]

Eutrophication refers to an increase in the rate of supply of organic matter to an ecosystem, which most commonly is related to nutrient enrichment enhancing the primary production in the system (Nixon, 1995). Eutrophication levels vary due to natural causes from area to area.

Overloading with nitrogen (N) and phosphorus (P) can result in a series of undesirable effects. Excessive growth of plankton algae increases the amount of organic matter settling to the bottom. This may be enhanced by changes in the species composition and

42 European Environment Agency, http://themes.eea.eu.int/
43 European Environment Agency , Topic report 7/2001, http://reports.eea.eu.int

functioning of the pelagic food web by stimulating the growth of small flagellates rather than larger diatoms, which leads to lower grazing by copepods and increased sedimentation. The consequent increase in oxygen consumption can in areas with stratified water masses lead to oxygen depletion and changes in community structure or death of the benthic fauna. Bottom dwelling fish may either die or escape. Eutrophication can also promote the risk of harmful algal blooms that may cause discoloration of the water, foam formation, death of benthic fauna and wild or caged fish, or shellfish poisoning of humans. Increased growth and dominance of fast growing filamentous macro algae in shallow sheltered areas is yet another effect of nutrient overload which will change the coastal ecosystem, increase the risk of local oxygen depletion and reduce biodiversity and nurseries for fish.

The major impacts of eutrophication are thus:
· changes in the structure and functioning of the marine ecosystems;
· reductions in biodiversity;
· reductions in the natural resources of dermersal fish and shellfish;
· reduced income from maricultures of fish and shellfish;
· reduced recreational value and income from tourism;
· increased risk of poisoning of animals including humans by algal toxins.

Ground level ozone[44]

Ground level ozone (O_3) is formed by a chemical reaction between nitrogen oxides (NO_x) and volatile organic compounds (VOC) in the presence of heat and sunlight. Ground-level ozone is a harmful pollutant and the main constituent of smog.

Ozone is a strong photochemical oxidant, which causes serious health problems and damage to ecosystems, agricultural crops and materials. Human exposure to elevated ozone concentrations can give rise to inflammatory responses and decreases in lung function. Symptoms observed are cough, chest pain, difficulty in breathing, headache and eye irritation. Ozone exposure of ecosystems and agricultural crops results in visible foliar injury and in reductions in crop yield and seed production. For vegetation, a long-term growing season average exposure rather than an episodic (short-term) exposure is of concern. Adverse effects on vegetation can be noted at relatively low ozone levels.

Harmful ozone concentrations are observed over the whole of Europe. Formation of ozone takes place at various space and time scales: the high emission density of reactive precursors in urban areas might lead to high ozone levels within the city or at short distances downwind. But ozone precursors may also be transported over distances of hundreds to thousands of kilometers, resulting in ozone formation far from the sources.

[44] European Environment Agency, http://themes.eea.eu.int/ and U.S EPA, http://www.epa.gov/

Annex 2 - Audit[45]

In much the same way as a financial audit is performed, an audit of emission data draws on financial auditing standards to provide a high, but not absolute, level of assurance that the information being audited is free of material misstatement. The auditor plans and executes the required work under these established professional-auditing standards.

In an emission audit, the auditor will be required to provide assurance that the emission data, which is the subject of the audit has been measured/reported in accordance with a predetermined emission measurement and reporting standards and is free of material misstatement. Until recognised emission measurement and reporting standards are developed, the preparer of emission data will need to define the measurement/reporting framework that has been used to prepare the emission data. The auditor's report on the emission data will be based on this disclosed measurement and reporting framework. The auditor will therefore need to determine and indicate in the report whether this is a generally accepted framework, both nationally and internationally, and whether the auditor is satisfied that it is appropriate in the circumstances.

Auditing standards require that the auditor plan and perform the audit to obtain reasonable assurance that the financial statements are free of material misstatement. As part of the planning of an audit, the auditor obtains an understanding of the accounting and internal control systems sufficient to plan the audit and develop an effective audit approach. The auditor 's professional judgement is used to assess audit risk and to design audit procedures to ensure it is reduced to an acceptably low level. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the verification claim statements. An audit also includes assessing the reporting principles used and significant estimates made by management, as well as evaluating the overall presentation of the information.

Review

The objective of a review engagement is to enable the auditor to state whether, on the basis of procedures performed (which do not provide all the evidence that would be required in an audit), nothing has come to the auditor's attention that causes the auditor to believe that the emission data being reviewed contains any material misstatement (so called negative assurance). The auditor performs the review and reports in accordance with established professional auditing standards applicable to review engagements.

Again, until recognised emission measurement and reporting standards are developed, the preparer of emission data will need to define the measurement/reporting framework that

[45] IAS, International Accounting Standards and IFAC, International Federation of Accountants

has been used to prepare the emission data. The auditor's report on the emission data will be based on this disclosed measurement and reporting framework. The auditor will therefore need to determine and indicate in the report whether this is a generally accepted framework, both nationally and internationally, and whether the auditor is satisfied that it is appropriate in the circumstances.

The scope of the work performed in a review remains the responsibility of the auditor, but, as the nature, timing and extent of the procedures are less extensive than those performed in an audit engagement, the auditor is less likely to become aware of all significant matters. Only a moderate level of assurance is therefore expressed, by way of a negative assurance.

A review comprises inquiry from company officials and analytical procedures, which are designed to review the reliability of the information presented. Although a review involves the application of audit skills and techniques and the gathering of evidence, it does not ordinarily involve an assessment of accounting and internal control systems, tests of records or responses to inquiries by obtaining corroborating evidence through inspection, observation, confirmation and computation, which are procedures ordinarily performed during an audit.

Agreed upon Procedures

In an agreed upon procedures engagement, the auditor is engaged to carry out specific procedures and report the results of these procedures to parties who have agreed the procedures performed. As the auditor does not determine the nature, timing or extent of these procedures, no assurance is expressed.

The auditor reports information about the work performed together with the factual findings, to allow the parties concerned to draw their own conclusions on the adequacy of the emission data. No assurance is provided. This report is restricted to those parties who have requested and agreed the procedures to be performed since other parties, unaware of the reasons for the procedures, may misinterpret the results. Moreover, an agreed upon procedure engagement results in a report that is only suitable to the parties concerned. A wider distribution such as would be needed for a trade of CO_2, SO_2 or NO_x rights on an exchange will not be possible. For this reason, an agreed upon procedure is not a suitable solution.

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27. United Nations Economic Commission for Europe's (UNECE) Convention on Long-Range Transboundary Air Pollution. The eight protocol of the convention is the "The 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone". The Protocol sets national emission ceilings for 2010 for four pollutants: sulphur, NOx, VOCs and ammonia. More than 30 countries are included in the protocol, for example, Canada, USA and the countries of the EC.

28. COMMON POSITION (EC) No 51/2000 adopted by the Council on 7 November 2000 with a view to adopting Directive 2000/.../EC of the European Parliament and of the Council of ... on national emission ceilings for certain atmospheric pollutants (2000/C 375/01)
29. http://www.classification-society.org/
30. http://www.sjofartsverket.se, SJÖFS 1998:13
31. International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78), http://www.imo.org/
32. http://www.sjofartsverket.se, SJÖFS 1998:13
33. Exhaust Gas Emissions from Sea Transportation, .TFB Report 1993:1, MariTerm AB and Swedish Transport Research Board
34. UREA is broken down by the heat in the exhaust gases and the forms ammonia as an intermediary product, then nitrogen gas, water and carbon dioxide is formed instead of nitrogen oxides (Nox)
35. http://www.sjofartsverket.se, SJÖFS 1998:13
36. Annex VI of Marpol 73/78, Resolution 2, http://www.imo.org or http://www.sjofartsverket.se, SJÖFS 1998:13
37. The IMO is working on guidelines for on-board NO_x monitoring and recording devices (IMO DE 45/4), which could be the future standard if it becomes affordable
38. Footnot: IETA (International Emissions Trading Association) Working Group“Clean development mechanism (CDM) Audit Protocols and Methods” The Working Group CDM Audit Protocols and Methods”consists of representatives of major attestation service providers internationally, who will be expected to participate in future CDM validation and verification/certification. The group has been set up to review existing guidelines, with the aim of providing comprehensive audit guidance covering validation and verification of CDM projects. Members of the Working Group are: PricewaterhouseCoopers, KPMG, Det Norske Veritas, SGS and TUV Süddeutschland, IETA Memo 25-01-2002
39. NMHI, Norway’s Meteorological and Hydrological Institute and Swedish Maritime Administration Memo 2001-10-03 by Stefan Lemieszewski
40. IMO, International Maritime Organisation and Swedish Maritime Administration Memo 2001-10-03 by Stefan Lemieszewski
41. Proposal for a framework Directive for greenhouse gas emissions trading within the European Community - COM (2001)581
42. European Environment Agency, http://themes.eea.eu.int/
43. European Environment Agency, Topic report 7/2001, http://reports.eea.eu.int
44. European environment Agency, http://themes.eea.eu.int/ and U.S EPA, http://www.epa.gov/
45. IAS, International Accounting Standards and IFAC, International Federation of Accountants