International Maritime Emissions – Case for Action

Mitigation Benefits: Early industry action halves the cost

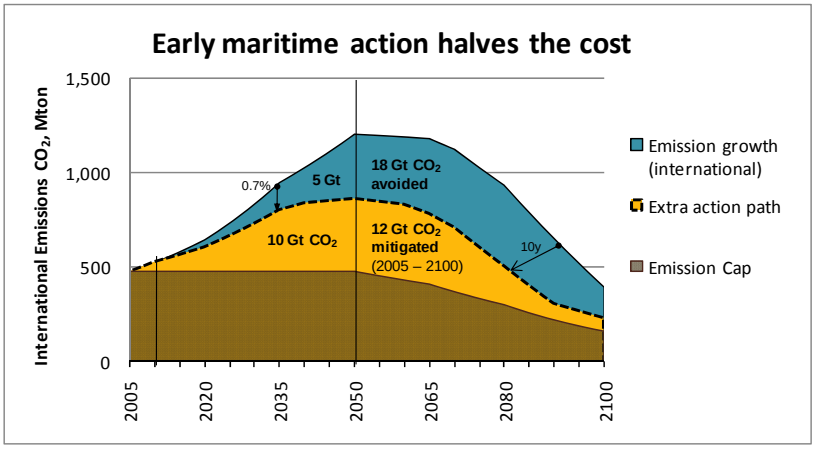
Dealing with the greenhouse gases emissions globally is a sound business and environmental decision. It is highly unlikely that maritime sector could escape stringent CO_2 emission constraints in the next few years.

Success of a sectoral action depends on both immediate and future benefits:

1. Current emissions reductions outside of the sector (most cost efficient)
2. Future emissions reduction due to additional industry improvements (extra action)

A forecast for emission from international[1] maritime has been constructed based on UNFCCC emission data for 1990-2004 (maritime bunker fuels) and current assumptions regarding traffic and emission trends by 2050[2]. The model was further expanded by assuming three technological step changes from 2051 onwards[3].

Early industry action would halve the industry costs while bringing very significant environmental benefits by **avoiding emission of 23 $GtCO_2$**, from international maritime globally (**5 $GtCO_2$ by 2050**, 18 $GtCO_2$ after 2050).



The calculated **demand for emission certificates is: 10 $GtCO_2$ before and 12 $GtCO_2$ after 2050**, assuming the extra action, funding and improvements are executed (total 22 $GtCO_2$; shown in yellow above). We have assumed an emission cap for international maritime industry at the 2005 emission level by 2050 (estimated at 478 $MtCO_2$); after 2050 the cap slides down to by 65% to 165 $MtCO_2$).

If there were no extra industry action - supported by appropriate funding - the additional annual 0.7% efficiency improvements by 2050 and bringing forward the step changes by about 10 years cannot be justified[4]. In the **"no extra action" scenario, the total emissions** by 2100 are **twice as large at 45 $GtCO_2$,** with **15 $GtCO_2$ by 2050** (=5+10) and **30 $GtCO_2$ after 2050** (above the cap)**.**

One of the underlying goals of the proposed fund is to provide the significant funding for industry action and improvements, and provide it quickly to avoid the future environmental damage and ship operator costs.

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[1] The forecast is for all international civil maritime. Domestic maritime transport is excluded.

[2] Model is divided into the Kyoto Annex 1 and non-Annex1 countries. It uses net emission growth factors aligned with the forecasts for traffic growth, emissions, and efficiency improvements till 2050 (top and bottom up projections). No official forecast or scenarios exist for 2050-2100 and therefore parameters approximating the economics assumptions have been selected to create an indicative scenario (impact of step changes is modeled separately).

Annual Emission Growth International Maritime	2005 - 2020	2021 - 2035	2036 - 2050	2051 - 2065	2066 - 2080	2081 - 2100
Annex 1 countries	**1.8%**	**2.3%**	**1.3%**	**0.5%**	**-0.3%**	**-0.5%**
Non Annex 1	**2.3%**	**2.8%**	**1.8%**	**0.5%**	**-0.3%**	**-0.5%**
World: effective average	2.1%	2.6%	1.6%	0.5%	-0.3%	-0.5%
Emission multiple: end year/2005	1.4	2.0	2.5	Depend on step changes		

[3] The step changes assume combination of alternative fuels and new ships reducing the emission by 40%, 95% and 97%, respectively. Each step change applies to a portion of existing fleet and takes from 20 to 40 years to be fully deployed (three periods: 2050-2070, 2070-2100, and 2080-2120). The change affects 30%, 40% and 30% of fleet, respectively. For the extra action path, the changes are brought forward by 10 years.

[4] The annual industry improvements of 0.5%-1% have already been deducted. Any additional sustainable and global improvements require funding and co-operation.

Note: To align with the 2008 IMO's emission estimates mulitply the results by 2 (1GtCO2 in 2005).

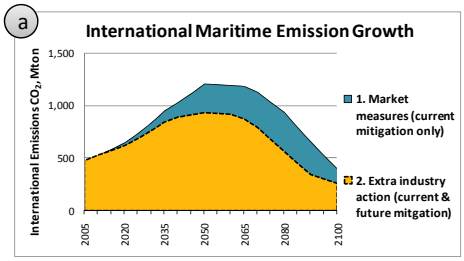
Future Mitigation is Critical

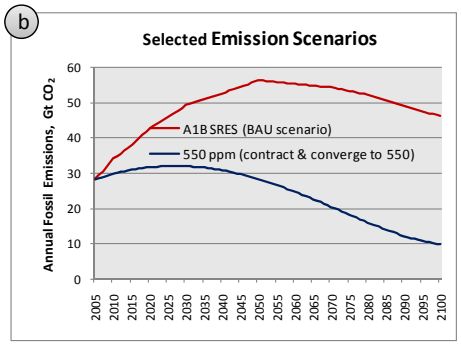
The current global stabilization scenarios call for greenhouse gases emission reductions in coming decades. The ability to significantly reduce emissions in future is therefore even more important than reductions today. For any industry where the emission is expected to grow continually this future mitigation aspect is critical.

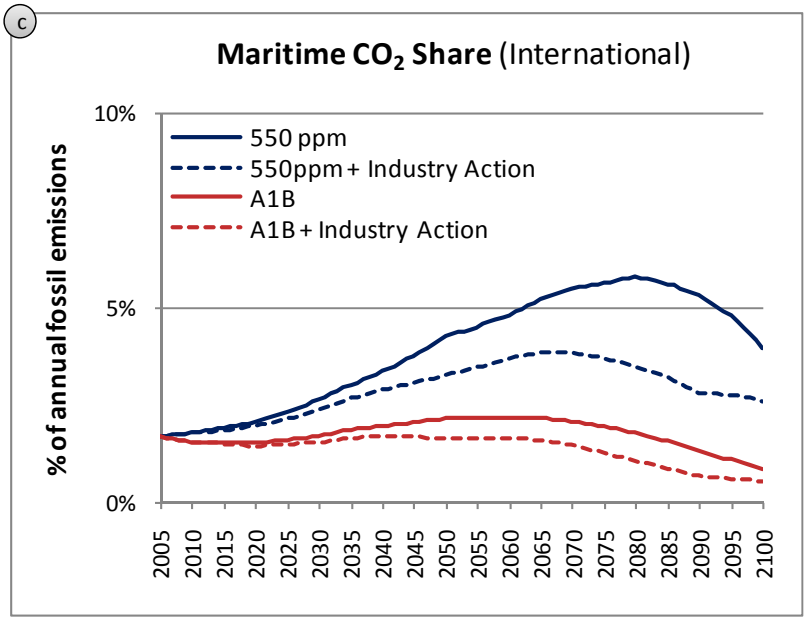
To assess the scale of regulatory and public pressure for action we have created a forecast of emissions from international maritime and compared it with the global fossil emissions.

Emissions from all international maritime transport in 2005 (base year) are estimated at 478 Mt CO_2, which amounts to 1.7% of global fossil CO_2 emissions. This share of CO_2 emissions will increase over the next few decades due to both absolute growth in maritime and reduction of emissions in other sectors[5].

To demonstrate the scale of the problem we use international maritime emission growth forecast (shown in Figure a below) and consider two climate scenarios: business as usual (A1B SRES) and a scenario to stabilize the concentration of greenhouse gases at 550 ppm level[6] (shown in Figure b).







a / b = c

The contribution of international maritime to climate change grows significantly (Fig. c), for the anticipated stabilization scenario. **If no extra improvement action is taken, international maritime CO_2 share** of world's fossil emission **will double to 3.4% by 2040, and more than triple to 4.3% by 2050** (growing afterwards to nearly **6% at 2080**, in the stabilization scenario). It seems unlikely that without any additional industry action, maritime could continue to successfully operate with such a growing carbon footprint.

Additional scenarios, marked with "Industry Action" in Fig c, illustrate the clear benefits of the extra industry improvements (such an action must go beyond rudimentary, regional market based instruments like the European Union Emissions Trading Scheme, EU ETS).

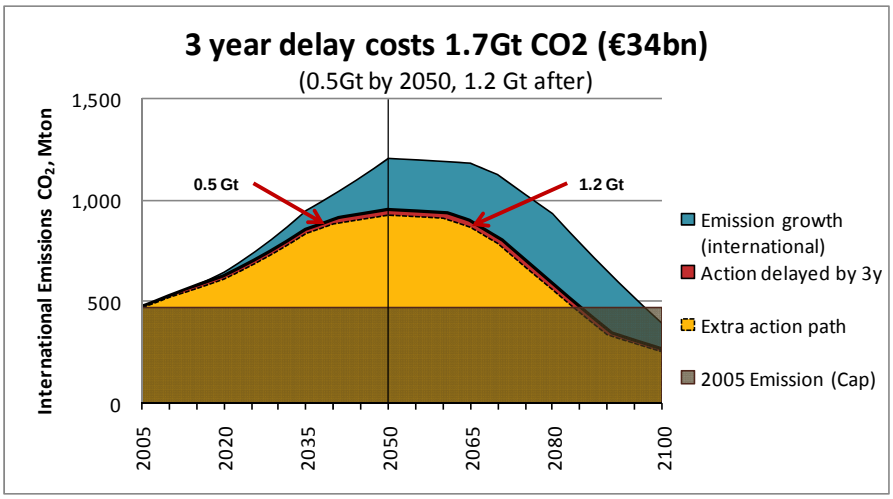
[5] The emissions from international maritime are forecast to grow continually for the next few decades. Fuel and operational improvements will not offset the annual traffic growth. At the same time, many developed countries are already targeting emission reductions in the region of 60%-80% by 2050.

[6] ppm (parts per million) is the ratio of the number of greenhouse gas molecules to the total number of molecules of dry air. Note that many commentators argue that 550ppm is already a very dangerous territory for climate change and recommend policies targeting lower concentration. A1B scenario is equivalent to stabilization at 850ppm level (IPCCC, AR4 report).

Note: To align with the 2008 IMO's emission estimates mulitply the results by 2 (1GtCO2 in 2005).

Acting in 2007 to avoid cost of delay: nearly 2 $GtCO_2$ for 3 years

Delaying the extra industry improvements by 3 years is equivalent to additional emissions of 1.7 $GtCO_2$, with 0.5 $GtCO_2$ by 2050. An estimated cost of delay is therefore €34bn ($43bn), assuming €20 per 1 tCO_2.



The industry cost of delaying global action even for a couple of years is therefore very significant, measured in tens of $billions while environmental impact is measured in emission of billions of tons of CO_2.

Political aspects of adaptation funding

Adapting to climate change is especially important to the developing countries as they are already suffering the effects of climate change. However, the international funding dedicated to adaptation is far too small than the anticipated needs ($180m promised against the needs measured in tens of $billions)[7].

Dealing with this is not only a matter of need and equity, however. It also may be **a condition for further progress in mitigation**[8], including participation of ship operators from developing world in any global approach to maritime emissions.

The IMCC Fund has been designed to channel a significant funding raised through emission charges to climate adaptation in developing countries[9].

Additional reasoning for a hybrid mechanism

Policy makers prefer to use quantity instruments to deliver emission reductions such as the European Emission Trading Scheme (EU ETS, the world's largest trading scheme covering 46% of European CO2 emissions). The overriding reason of political acceptability due to the clear emission target is so strong that the cost-benefit analysis is often not performed against the price type and hybrid instruments with equivalent or better efficiency[10]. The just completed study commissioned by European Commission highlighted the practical difficulties of designing and implementing a solution for maritime CO_2 emissions based on trading systems, like EU ETS[11].

[7] Müller B, Hepburn C., IATAL – An outline proposal for an International Air Travel Adaptation Levy, http://www.oxfordenergy.org/pdfs/EV36.pdf

[8] Burton I., Diringer E., Smith J., Adaptation to Climate Change: International Policy Options, Pew Center on Global Climate Change, Nov 2006, http://www.pewclimate.org/docUploads/PEW_Adaptation.pdf

[9] This builds on the idea of IATAL proposed by B. Müller and C. Hepburn (see above). IATAL proposed levy for adaptation from international air travel.

[10] Discussed by many economists, including: M. Weitzman, W. Nordhaus, C. Hepburn, W. Pizer (see also Pew report). The hybrid schemes are only recently receiving significant attention as they theoretically can be more complex, but politically are often superior for acceptability.

[11] CE Delft, Germanischer Lloyd, MARINTEK, Det Norske Veritas, Greenhouse Gas Emissions for Shipping and Implementation of the Marine Sulphur Directive, December 2006, http://ec.europa.eu/environment/air/pdf/transport/final_report.pdf

Note: To align with the 2008 IMO's emission estimates mulitply the results by 2 (1GtCO2 in 2005).

Moreover, scaling the quantity instruments globally, even for a single industry, is also without a precedent. Even linking up regional schemes is arguably going to face significant political, economical and legal challenges[12].

International shipping which is outside the Kyoto protocol **is the best candidate for a carve-out approach of global action**. The reality is, that due to the growth and lack of substitutes for international maritime all participating ship operators will be just net buyers of certificates in any trading regime.

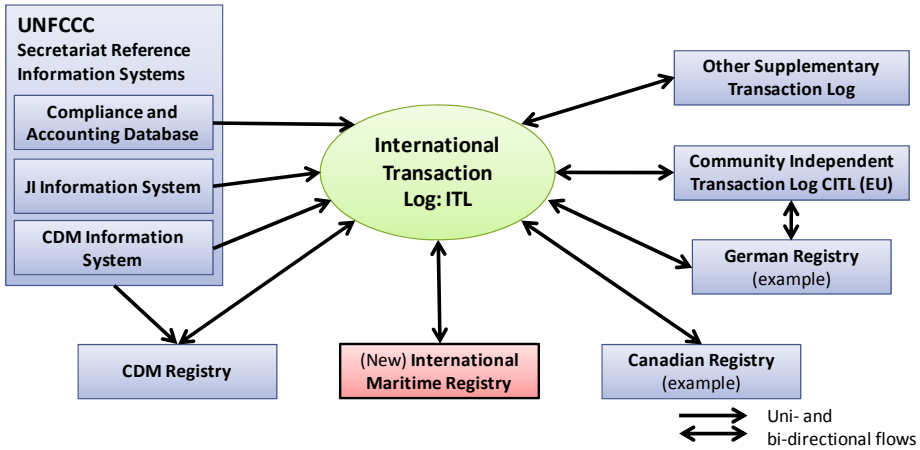
The fact that a liquid market in emission certificates already exists[13], enabling investment techniques to be incorporated into a hybrid approach has been overlooked so far[14].

The charge & cap approach has been **designed for maximum efficiency** and to ensure that mitigation and adaptation are accelerated through additional global funding (including industry improvements).

Emission trading compliance

To interact with the other trading systems and be compliant with any post-Kyoto regime a new registry for the international maritime sector will be created within the network of UNFCCC registries (shown below).

Adding **maritime** to the network of linked registries



The dedicated registry approach will allow the trading of different emission certificates and would guarantee consistency of the overall system at the lowest cost.

The CO_2 emission should be measured according to the IMO and IPCC guidelines while the accounting and verification will be subject to ISO 14064 standard for greenhouse gas accounting and verification (published in March 2006).

Benefits to shipping operators

Regulatory and reputational risks significantly reduced. **EBITDA** (cash-flow) **increased by 0.5%**.

[12] Kruger J., Oates W., Pizer W., Decentralization in the EU Emissions Trading Scheme and Lessons for Global Policy, Resources For The Future, RFF DP 07-02, http://www.rff.org/rff/Documents/RFF-DP-07-02.pdf

[13] Details about liquidity are available.

[14] Unsurprisingly perhaps as climate change has been primarily the domain for scientists, economists and politicians. See the "New-Eco Warriers", The Banker, Jan 2007, http://www.thebanker.com/news/fullstory.php/aid/4676

Note: To align with the 2008 IMO's emission estimates mulitply the results by 2 (1GtCO2 in 2005).