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PREVENTION OF AIR POLLUTION FROM SHIPS

Consideration of appropriate targets for reducing CO_2 emissions from international shipping

Submitted by Japan

SUMMARY

Executive summary:	Based on the analysis of the expected efficiency improvement of ships with various measures including utilization of new technology, Japan presents scenarios for the reduction of CO_2 emissions in this sector and proposes the general policy direction on market-based mechanism to reduce CO_2 emissions from ships
Strategic direction:	7.3
High-level action:	7.3.1
Planned output:	7.3.1.3
Action to be taken:	Paragraph 20
Related documents:	MEPC 59/4/34 and MEPC 59/INF.27

Introduction

1 In this document, Japan presents an overview on the prospect of world seaborne trade and associated prediction of CO_2 emissions from international shipping. Based on an analysis of the expected efficiency improvement of ships with various measures including utilization of new technology (the details are provided in another Japanese submission: MEPC 59/INF.27), Japan presents scenarios for reduction of CO_2 emissions in this sector and proposes a general policy direction on market-based mechanisms to reduce CO_2 emissions from ships.

Components of CO_2 Emission Reduction

2 In principle, the amount of CO_2 emissions is determined by multiplying the level of activity with its efficiency. In the case of international shipping, the level of activity means the amount of transported cargo, which is expressed by "tonne-mile" unit, and the efficiency means the amount of CO_2 emissions per unit transported cargo, which is expressed by "g/tonne-mile". This relationship is given by the following equations:

<u>CO_2 emissions = Activity × Efficiency</u> - Activity = Transported Cargo (tonne-mile) - Efficiency = CO_2 Emissions/Unit Transported Cargo (g/tonne-mile)

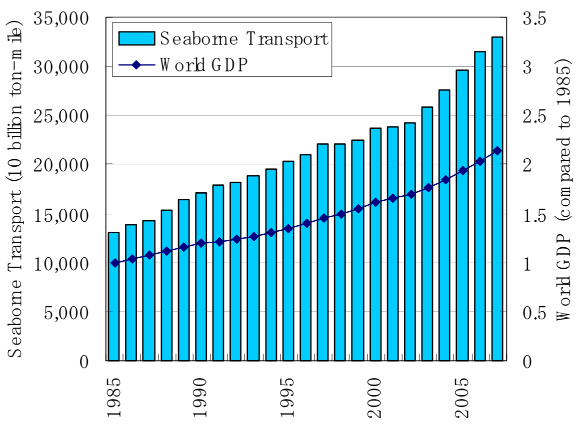
Hence, for CO_2 emission reduction from international shipping, either/both of the followings is/are necessary:

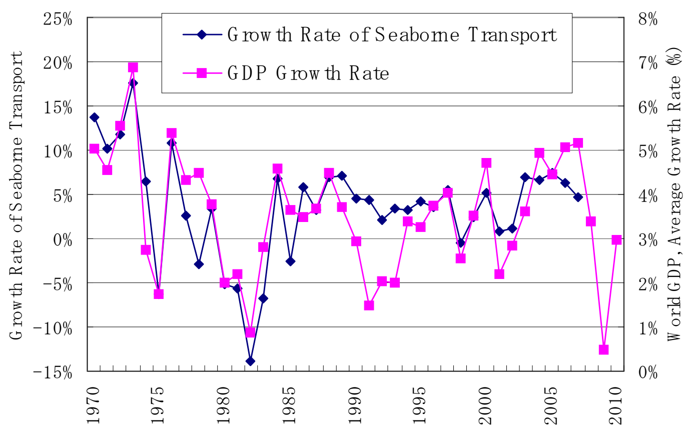
Option A) Reduction of activity level (reduce the transported cargoes); and

Option B) Improvement of the efficiency.

Seaborne Trade and World GDP

3 International shipping provides essential transport service for economic activities, of which demand is determined by the global economy, i.e. by factors extrinsic to the shipping sector. In other words, the demand for international shipping is not determined only by domestic or regional economic situations, but rather it is influenced mainly by the global economy. This is a distinctive and notable characteristic of international shipping. Figure 1 and Figure 2 demonstrate the close relationship between seaborne transport and the world GDP.





Source: - World GDP: IMF - Seaborne transport: Fearnleys Review

Figure 1. Trend of seaborne transport volume and world GDP

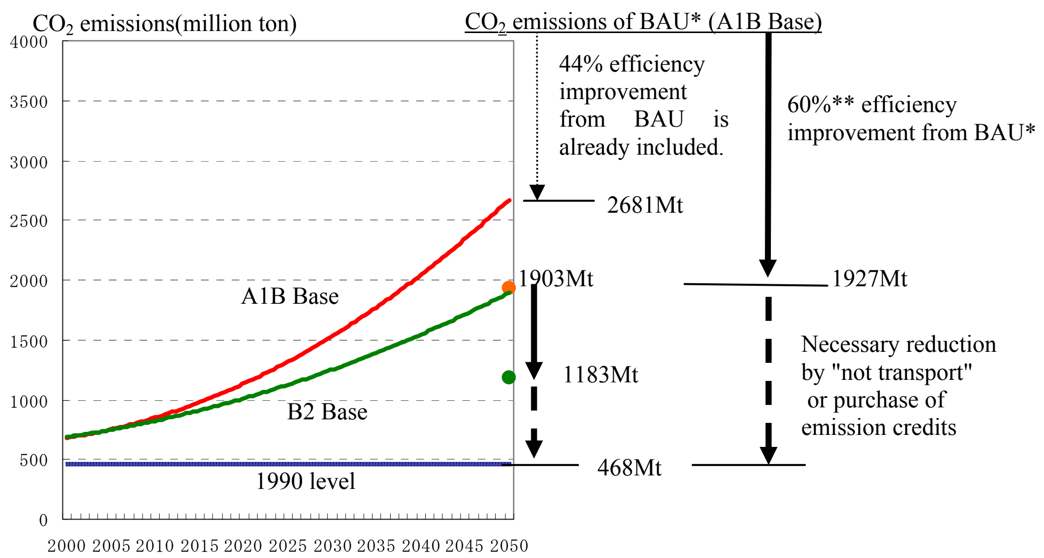
Figure 2. Growth rates of seaborne transport and of world GDP

4 One characteristic of international shipping is that it transports mainly cargoes such as oil, goods and commodity, which is quite different from international aviation or land transportation which transports mainly people. Considering that approximately 90% of the global trade depends on international shipping, it can be said that international shipping serves as "life blood for the global economy". The total amount of blood circulation (transport volume) is determined by the level of activity of the whole body (all economic activities on the globe). It is impossible to drastically reduce the amount of blood circulation (transport volume) while the total activity

level of the body is not controlled. Therefore, Option A in paragraph 2 (reduction of activity) should not be considered as a primary option for emission reduction.

5 As mentioned earlier, since the demand for international shipping is determined by the global economy, seaborne trade is closely correlated to the world GDP (Figure 1 and Figure 2). The international Monetary Fund (IMF) regularly provides prediction of GDP growth rates. In October 2008, IMF predicted that the GDP growth rate for 2009 would be 3.0%, but in January 2009, IMF changed the rate downwards to 0.5%. The GDP prediction can change significantly in such a short time. This suggests that prediction of the global economy, especially in the long-term, is extremely difficult, so is the prediction of future seaborne transport volumes.

6 Figure 3 indicates predictions for CO_2 emissions from ships, which assume different growth scenarios for international shipping but assume continued efficiency improvement of ships. The huge difference between the two curves is caused only by the difference in assumed transport demand (i.e. the growth rate of global economy).



* Business As Usual (BAU) assumes that none of efficiency improvement measures is taken, including speed reduction and the application of new technology.

** Estimated as the maximum average efficiency improvement for all types of vessels after 2035 based on foreseeable technologies.

Figure 3. Total emission curves based on different growth scenarios

Concerns on capping in absolute term on the total emissions from international shipping

7 Taking into account the characteristics of international shipping as explained in paragraphs 3 to 5, there is a reasonable doubt on the practicability of capping the total amount of CO_2 emissions from ships. Commission of the European Communities announced its views[1] on targets for reducing CO_2 emissions from international shipping as: "*As part of the Copenhagen agreement the UNFCCC should set targets for reducing the climate impact of these sectors below 2005 levels by 2020, and significantly below 1990 levels by 2050*". To have a closer look at how such a target can be achieved, Japan conducted the following case studies based on two scenarios from IPCC SRES report, as well as taking into account the Second IMO GHG Study 2009. In the case where A1B scenario is taken from the IPCC SRES and the expected transport demand

1 "*Towards a comprehensive climate change agreement in Copenhagen*" released on 28 January 2009.

is "Base" ("A1B Base", hereafter), the total CO_2 emissions in 2050 are estimated to be 2,681 Mt under the Second IMO GHG Study 2009 where 44% efficiency improvement[2] of ships from BAU (Business As Usual) is already included. In case B2 scenario is taken from IPCC SRES and the expected transport demand is "Base" ("B2 Base", hereafter), the total CO_2 emissions in 2050 are estimated to be 1,903 Mt under the Second IMO GHG Study 2009 where 36% of efficiency improvement from BAU is already included.

8 Under the target (capping) proposed by the EC, in case of A1B Base, CO_2 emissions in 2050 would have to be reduced to only 17% (2,681 Mt to 468 Mt) of the estimated amount in the Second IMO GHG Study 2009. This means that, even if the efficiency improvement is further enhanced to as high as 60%, the transport volume would have to be suppressed to as low as 24% of the estimated amount (1,927 Mt to 468 Mt). Even in the case of low growth scenario of B2 Base, seaborne trade volume would have to be reduced to as low as 40% (from 1,183 Mt to 468 Mt), on top of the 60% efficiency improvement.

9 Such suppression of seaborne trade is not imaginable in practical terms. One may argue that the shipping sector can purchase the emission allowance from other sectors. However, in the case of A1B Base, the international shipping sector, on top of the considerable (60%) efficiency improvement, will have to purchase emission credits of 1,459 Mt, which is almost twice as much as the emissions from the same sector in 2007. Purchase of such amounts of emission credits would be an extremely heavy burden, noting that it amounts to approximately 5% of the current total CO_2 emissions from all sectors. Shipping is a transport mode with already (at present) high efficiency compared with other modes, and it is assumed here that it will achieve very high efficiency improvements (the improvement potential is explained in MEPC59/INF.27). If the shipping sector, which would further enhance the already-high efficiency, have to absorb such an overwhelming and unbalanced burden, the outcome could be distortion of competitive conditions and misguided demand with shift away from the most energy-efficient transport mode.

Way forward

10 Recognizing that capping of CO_2 emissions should not be applied to international shipping, how can the reduction target for international shipping be set in a reasonable manner? Since the international shipping sector, as providers of indispensable service to the global economy cannot affect the demand by itself, there is no choice but to improve the efficiency. Taking into account the high potential for efficiency improvements, IMO should present and promote an efficiency-based policy direction to the outside world, and for that purpose, it is essential to present estimated trends of total CO_2 emissions from international shipping based on the anticipated efficiency improvement of ships.

11 Considering the above, Japan proposes to:

.1 consider the levels of efficiency improvement that are technically achievable, set the relevant targets, and endeavour to establish a regulatory framework that is most suitable to achieve such targets; and

[2] The Second IMO GHG Study 2009 indicated the assumed efficiency improvement as 35% for ocean-going vessels, 47% for container vessels and 39% for coastwise shipping. 44% efficiency improvement, which is an average figure for all ship types, is calculated from the estimated CO_2 emissions provided in the Second IMO GHG Study 2009 and that of BAU which Japan calculated based on the assumptions used in the Second IMO GHG Study 2009.

.2 develop the trend curves for CO_2 emissions based on the efficiency targets above, taking into account different scenarios for transport demand dependent on multiple economic growth projections and present the curves as the "expected outcome" of IMO's regulatory package.

12 For this purpose, Japan conducted detailed case studies on the estimation of efficiency improvement of representative ship-types; the case studies considered possible changes of principal particulars of ships and utilization of new technologies and estimated the potential for efficiency improvements. Table 1 shows the summary of the efficiency improvements based on the case studies, further details are provided in MEPC 59/INF.27.

Flexible and practical approach of goal setting

Table 1 – Efficiency improvement based on case studies of representative ship types

Contract	2012-2016	2017-2021	2022-2026	2027-2031	2032-	Remarks
Delivery	2015-2019	2020-2024	2025-2029	2030-2034	2035-	
Bulk/General cargo	25%	40%	45%	50%	50%	Excluding coastwise shipping
Tanker	35%	40%	55%	55%	55%	Excluding coastwise shipping
VLCC	40%	50%	60%	60%	60%	
Container	35%	45%	55%	65%	70%	Excluding coastwise shipping
Coastwise shipping	20%	25%	30%	30%	30%	

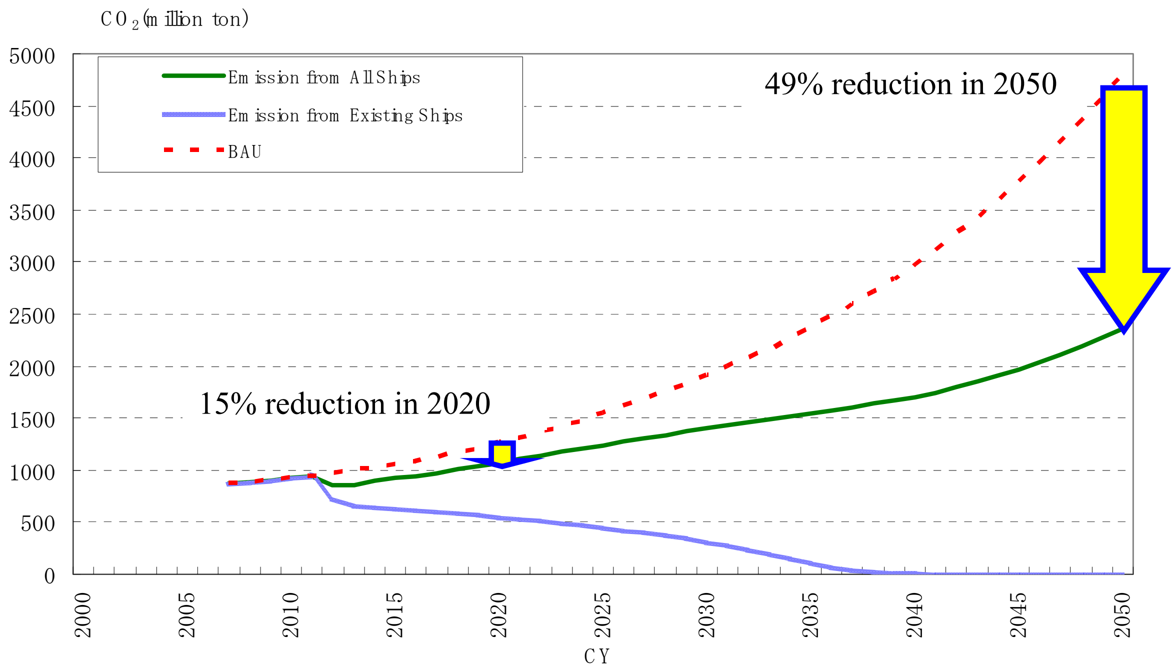
* As to coastwise shipping, it is assumed that DWT remains unchanged, the speed reduction rate is 10%, and the impact of new technology is assumed to be limited to 50% of that for panamax bulker.

* For the efficiency improvement of ocean-going vehicle and RoRo (2,000 + lm) as categorized by *IMO-GHG study*, they are assumed as the same as coastwise shipping because case studies for such ships have not been conducted.

* Assumed package of new technologies took into account its costs and technical feasibility.

* The use of alterative fuels is not considered, as the prediction of costs and efficiency gains is not available.

13 Figure 4 and Figure 5 present the expected trend curves for CO_2 emissions based on the A1B Base and B2 Base, respectively, both of which assume efficiency improvements of new ships as presented in Table 1 and a 10% speed reduction for existing ships (for container ships, 15% speed reduction scenarios).



* Business As Usual (BAU) assumes that none of efficiency improvement measures is taken, including speed reduction and new technology.

Figure 4. The estimated CO_2 emissions curve of A1B Base

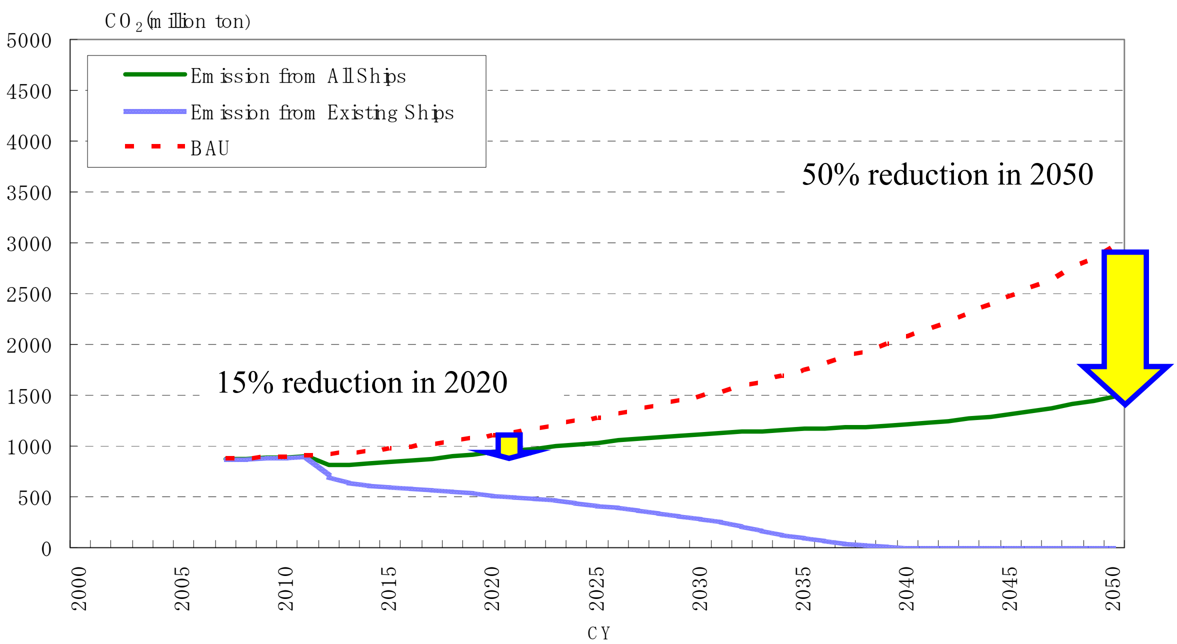


Figure 5. The estimated CO_2 emissions curve of B2 Base

14 The calculation model was developed using the same ship categories as the Second IMO GHG Study 2009, as well as the same category-specific assumptions such as average engine output, SFC and yearly operation hours. The model also takes into account different timing of replacement to new ships by ship type. The effects of speed reduction have been incorporated in the model as an increased number of ships will be necessary to transport the same cargo volume (tonne mile)[3].

15 Although the trend of the CO_2 emissions curves is upwards, particular attention should be paid to very large emission reductions compared with BAU (business as usual) because of the considerable efficiency improvements.

16 Such trend curves should not be used to set the cap; they are the "expected outcome" by establishing and implementing effectively the regulatory framework by IMO, and should be reviewed based on actual results of emissions in the future. Japan is of the opinion that such a flexible approach to set the target is suitable for international shipping. To develop a powerful framework to achieve such ambitious efficiency improvement, Japan also presents its views on market-based mechanisms in document MEPC 59/4/34.

Conclusion

17 Japan is of the view that the regulatory package to be established by IMO should consist of the EEDI (Energy Efficiency Design Index), the SEMP (Ship Efficiency Management Plan), and a Market-based Mechanism that provides strong incentives for efficiency improvements.

18 In developing the regulatory package, it is essential for IMO to show to the world the expected outcome of such a package (CO_2 emission trend curves), with an appropriate target setting (on the efficiency of ships). In this process, it is necessary to bear in mind that:

.1 international shipping is the transport mode with higher efficiency than any other modes; it also has a large potential for further efficiency improvements;

.2 its growth rate is determined extrinsically by the global economic growth; and

.3 imposing a cap on the total CO_2 emissions from international shipping is not an appropriate approach, as it may not leave any room other than suppressing the transport activity or imposing unbalanced financial burdens; this would result in distorting competitive conditions at a disadvantage for shipping and possible modal shift away from the most efficient transport mode.

19 The target setting and the selected market-based reduction mechanism should be compatible and should take advantage, as much as possible, of the high potential for efficiency improvements within the shipping sector.

Action requested of the Committee

20 The Committee is invited to consider the general policy direction presented in this document and take action as appropriate.

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[3] One may notice that the reduction rates in Figure 1 and Figure 2 such as 15% in 2020 and about 50% in 2050 are smaller than those efficiency improvement figures in Table 1. This is explained by the increased number of new ships required for compensating the speed reduction to keep the same transport volume (ton mile).