The proposal

The EU Parliament on 16 September 2020 agreed to endorse proposed amendments on EU MRV Regulation (EU)2015/757 in order to take appropriate account of the IMO DCS. The proposed amendments include obligations on companies to reduce the annual $CO_2$ emissions per transport work by at least 40% by 2030, shipping to be included in the EU Emissions Trading System (EU ETS) from 1 January 2022, implementation of a holistic Union labelling system for the environmental performance of ships, an Ocean Fund to be established to support investment in innovative technologies and infrastructure to decarbonise the maritime transport sector. In addition, companies shall ensure that, by 2030, no ships under their responsibility emit GHG emissions when at berth in EU ports.

Here below is our proposal/initial concept for application of an Emissions Trading System (EU ETS) in shipping in line with the European Green Deal and the IMO Initial Strategy on the Reduction of GHG Emissions from Ships.

This proposal is designed to bring to light that there is substantial scope in pursuing an optimised way of sea trading which is responsible for up to an estimate of at least two thirds of the total sea transportation emissions. In contrast to the prospective savings by trade optimisation, the potential contribution of inventions of new energy efficiency devices or improvements on hull design is extremely limited and practically cannot achieve savings more than a few per cent points. However, thanks to the previous vast improvements in this area since the 1$^{st}$ oil crisis in the mid70s and the current era that oil prices range up to 1000$/mt the shipping sector and especially the ship-building sector were forced to focus on the most economy type vessels in terms of fuel oil consumption (FOC). As such, technological improvements should be part of the ETS but they cannot be the pillar or the main focus of an emissions regulation framework that aims at 40% emissions reduction by 2030. Trade optimisation on the contrary can achieve the EU goals on emissions reduction until the non–polluting alternative means of propulsion is invented through research and development and is made available in ships.

The significance of optimisation of the sea trade and its potential to achieve the emission reduction targets set by EU can be demonstrated through the following example:

A transporter (importer/exporter) has a typical cargo of one (1) million tonnes weight in hand to transport it from Rotterdam area to Far East (Qingdao area).

The negotiation of the sale contract between the cargo owner and the cargo buyer is subject to a number of options and ways that determine the transportation of the cargo and which substantially affect the emissions produced. For instance:

i. **The amount of cargo tonnes per shipment (the parcel).** This in turn will determine the size of the ship to be employed which can range from a handy size ship of 35000DWT to a cape size of 180000DWT.
ii. **The delivery time of each parcel which in turn dictates the time of loading and equally importantly the route the ship has to follow from the loading port to arrive at the destination on time and the speed at which the vessel has to proceed.** For this example, the route can be via Suez Canal, or the Panama Canal, or via Cape of Good Hope.
iii. **The range of ports out of which the transporter can load the cargo and the range of ports he can discharge the cargo.** The combination of the selected ports will affect the choice of ship size and hence maximum intake per ship, the load/discharge rates and hence the duration of port stays and will possibly provide the option of vessels being connected to cold ironing facilities (alternate marine power –AMP).

In respect of the climate change agenda as set by EU it is of outmost importance that the transporter before negotiating the above terms has to take into account the $CO_2$ emissions impact on the environment. This can be easily and effectively done by ETS. The transporter shall factor in the $CO_2$ emissions produced when calculating the cost of the various options he is negotiating under the sale contract.

The transporter should be free to choose from a combination of limitless options available for the cargo transportation. What it matters however, is that regardless of the selected option the transporter must be accountable for impact of the $CO_2$ emissions produced as compared to the ones of the optimum transportation for the specific cargo.

**Table 1** presents the $CO_2$ emissions and respective Emissions Index values for the above mentioned example cargo transportation at two typical speed options, via three possible routes from Rotterdam to Qingdao, using either small handy or cape size vessels. Fuel oil consumption (FOC) was calculated basis the actual days at sea depending on the voyage route plus consumption at port stays and any consumption while vessels are idle awaiting transit in Canals. Respective emissions were then calculated basis the total fuel oil consumption times the fuel mass conversion factor $C_F$=3.114 for Heavy Fuel Oil (HFO) as this was defined by IMO (*MEPC.1/Circ.684*). Special note must be given, that the denominator on the Emissions Index on the last column of **Table 1** was calculated basis the distance between ports via the optimum route (shortest). By this definition the Emission Index effectively portrays the voyage efficiencies reflecting the actual differences on $CO_2$ emissions in metric tonnes.

**Table 1: Emissions data for the transportation of cargo between Rotterdam and Qingdao areas. Data refer to three route options, two navigational speeds using vessels of two different capacities.**

**a) Rotterdam - Qingdao - Sailing speed: 14 knots**

| Voyage Route | Distance [miles] | Days | FOC sailing [mt] | FOC Port / Idle [mt] | total FOC [mt] | CO2 emissions [mt] | Cargo weight [mt] | Emissions Index [gCO2/tn/miles] |
|---|---|---|---|---|---|---|---|---|
| Panama Canal | 13414 | 40 | 26.5 | 9 | 1069 | 3328.9 | 35000 | 8.96 |
| Suez Canal | 10619 | 32 | 26.5 | 9 | 857 | 2668.7 | 35000 | 7.18 |
| Cape of Good Hope | 14134 | 42 | 26.5 | 6 | 1119 | 3484.6 | 35000 | 9.38 |

| Voyage Route | Distance [miles] | Days | FOC sailing [mt] | FOC Port / Idle [mt] | total FOC [mt] | CO2 emissions [mt] | Cargo weight [mt] | Emissions Index [gCO2/tn/miles] |
|---|---|---|---|---|---|---|---|---|
| Panama Canal | 13414 | 40 | 47 | 24 | 1904 | 5929.1 | 100000 | 5.58 |
| Suez Canal | 10619 | 32 | 47 | 24 | 1528 | 4758.2 | 100000 | 4.48 |
| Cape of Good Hope | 14134 | 42 | 47 | 20 | 1994 | 6209.3 | 100000 | 5.85 |

**b) Rotterdam - Qingdao - Sailing speed: 10 knots**

| Voyage Route | Distance [miles] | Days | FOC sailing [mt] | FOC Port / Idle [mt] | total FOC [mt] | CO2 emissions [mt] | Cargo weight [mt] | Emissions Index [gCO2/tn/miles] |
|---|---|---|---|---|---|---|---|---|
| Panama Canal | 13414 | 55.8 | 12.5 | 9 | 706.5 | 2200.0 | 35000 | 5.92 |
| Suez Canal | 10619 | 45.5 | 12.5 | 9 | 577.75 | 1799.1 | 35000 | 4.84 |
| Cape of Good Hope | 14134 | 58.9 | 12.5 | 6 | 742.25 | 2311.4 | 35000 | 6.22 |

| Voyage Route | Distance [miles] | Days | FOC sailing [mt] | FOC Port / Idle [mt] | total FOC [mt] | CO2 emissions [mt] | Cargo weight [mt] | Emissions Index [gCO2/tn/miles] |
|---|---|---|---|---|---|---|---|---|
| Panama Canal | 13414 | 55.8 | 23 | 24 | 1307.4 | 4071.2 | 100000 | 3.83 |
| Suez Canal | 10619 | 45.5 | 23 | 24 | 1070.5 | 3333.5 | 100000 | 3.14 |
| Cape of Good Hope | 14134 | 58.9 | 23 | 20 | 1374.7 | 4280.8 | 100000 | 4.03 |

Taking note of the data presented in Table 1:

i. If the transporter selects for the transportation of the total cargo of 1 million tonnes 10 ships of 100K cargo intake (and ports that can accommodate these ships), the $CO_2$ emissions produced (in actual metric tonnes) will be about 40% less than if sending the same total cargo in 30 ships of 35K tonnes cargo intake each.
ii. If transporter decides to perform the voyage at optimum speed in respect of emissions, keeping vessel size and route constant, the $CO_2$ tonnes emitted in optimum speed will be about 35% less.
iii. If the transporter selects the larger vessels and at the same time the shortest route via Suez Canal at optimum speed the emissions can be reduced by as much as 68%.
iv. Further to the above, it is in the interest of the transporter to employ the most efficient vessel which will also contribute to the overall emissions savings. This can contribute to an additional few per cent (2-3%) savings in $CO_2$ emissions depending on the technology this vessel is equipped with (energy efficiency devices, heat recovery systems minimising Auxiliary Engines use etc).
v. If ports of Rotterdam/Qingdao provide cold ironing then the savings in emissions from eliminating fuel oil consumption during port stays will also be up to 2%.
vi. If the vessels to be employed arrive at Rotterdam (loading port) on ballast trips from distance positions (Mediterranean, WAF, etc) the overall $CO_2$ emissions will increase for the particular transport. Therefore it is in the interest of the transporter to employ the ship closest to the loading port and whenever possible to try to combine and to promote triangle trade. Triangle trade as opposed to straight round voyages minimises the ballast trips.

The importance of triangle voyages and optimum speed can be further highlighted through the following example of a typical round voyage (which is the norm in shipping transportation) of a deep sea going vessel for transporting a 160,000mt cargo from South Africa to China.

The transporter could materialise this transportation in 2 different ways:

1. on a Cape size ship performing a round voyage at full speed from China to Richards Bay. Vessel sails ballast from China to Richards Bay and loaded Richard's Bay to China.
2. The same ship transporting same cargo on a triangle voyage. This is achieved by the vessel sailing from China to Taboneo, Indonesia to load 160,000mt cargo that will discharge at Gangavaram, India and from there sail ballast to Richard's Bay to load 160,0000mt to transport to China.

The emissions per cargo tonne mile under option 1 (round voyage) are 5.55grCO2/t/nm and in option 2 (triangle trade) is reduced to 3.38grCO2/t/nm. So the straight round voyage increases the $CO_2$ emissions by about 30% in comparison to the triangle voyage. The calculations for this example are included in ANNEX I.

It is evident that transporter's decisions as these are outlined above may result to a transportation plan that can achieve emissions reduction well in excess of EU targets for 2030. If transporter though remains unchallenged in terms of the environmental impact of the transportation then delivering the above mentioned cargo to its final destination can produce 3 times more emissions than the optimum.

It should also be highlighted that the $CO_2$ emissions are of equal importance towards the environment irrespective of the cargo type being transported. The emissions in ETS should be calculated per tonne mile and all transported cargoes, irrespective of cargo type, should contribute to emissions reduction. This approach makes the calculation of baselines and allowances in the ETS framework very simple. The legal entity responsible for surrendering emissions allowances should be the entity that decides and employs the appropriate ship and ultimately bears the fuel operating costs of that ship. Under most cargo sale contracts, the transporter, rather than the ship owner, is the decisive mind and it follows that it should be the responsible entity.

The EU regulators may adopt, if they so consider necessary, delegated acts to determine the baseline (for more than one vessel type) as the basis for the benchmark calculation for ETS. One way of achieving the 2030 goal of 40% reduction of emissions per transport work is to set the benchmark as calculated by IMO DCS and EU MRV data and introduce appropriate annual reduction factors and means for calculating and then collecting the excess emissions penalties until global emissions per tonne mile are closer to the desired level. On each of the subsequent adjustments of the benchmark and/or its factors, post enforcement in 2022, any new technologies made available in shipping should be taken into consideration as to incentivise continuous innovation and development.

A straight practical way of implementing the above could be as follows:

- The benchmark decided by EU should be addressed to all the transporters (the Europeans at first and then rest of world when IMO adopts this scheme) so that they will know the amount of $CO_2$ emissions per tonne mile permissible for the cargo transport. The permissible amount will be based on optimum vessel size, route and speed.

- The transporter should of course still be free to choose any ship and send the cargo in any parcel size through any route and at any speed so that the transportation industry will not be disrupted by the regulators. However, by applying a fee based on the calculated actual emissions relative to the benchmark set by the EU regulators, the transporter will be incentivised to adopt the most eco friendly transportation method when not restricted by their business plan.

- In simple words, the transporter will have to directly account for the cost of surplus emissions in addition to freight cost, insurance cost, bunker cost etc. This will act as a direct incentive to avoid unnecessary emissions.

- The transporter will naturally look for the least $CO_2$ polluting vessel to employ and the owner will be incentivised to provide the best performing ship in order to be preferred for employment.

- The transporter will be incentivised to instruct the vessel when possible to proceed at the most optimum speed and via the most optimum route so that emissions will be reduced to the overall benefit of both the transporter and the environment.

- In order to gain preference, the ports will also be incentivised to make the necessary investments to accommodate the most optimum ships and provide facilities for ships with AMP (alternate marine power) to use shore electricity once in port achieving zero $CO_2$ emissions. Ship-shore connectivity should be in line with DIRECTIVE 2014/94/EU which requires shore-side electricity supply be installed as a priority in ports of the TEN-T Core Network, and in other ports, by 31 December 2025.

The calculation and verification of the $CO_2$ emissions per tonne mile is a simple task for any sea transportation given the today's technology and available monitoring tools. The $CO_2$ emissions start at the point the ship was at the last discharging port prior to its new assignment and ends at the end of the final discharging port of the cargo. The amount of cargo is readily available by the loading documents (B/Ls or BOL), the ports and the distances are evident by the logbooks and can be confirmed by AIS and LRIT systems and the consumption is evident by vessel's logbooks, the MRV and the bunker delivery notes.

In conclusion, the idea and the purpose of this proposal are to incentivise the optimisation of the sea transportation for the benefit of the environment and in doing so also include the improvement of the ship itself. As such it outlined the importance of the transporter's decisions in the amount of $CO_2$ emissions produced during sea transportations and the significant contribution that trade optimisation can yield towards meeting the EU agenda on climate change through the ETS. This proposal also highlighted that restricting an emissions reduction regulation of such high targets to merely the introduction of new technologies in vessels requires that the non-polluting alternative to fossil fuels is invented and available for use. Only thereafter the responsibility for the emissions reduction can fall on the ship and the shipowner to adopt the new technology for the sake of the environment.

## ANNEX I

This Annex presents the calculations of emissions per transport work for a triangle voyage from China to Indonesia (Taboneo), India (Gangavaram), Richard's Bay South Africa and again China.

Fuel oil consumption (FOC) was calculated basis the actual days at sea depending on the voyage route plus consumption at port stays. Respective emissions were then calculated basis the total fuel oil consumption times the fuel mass conversion factor $C_F$=3.114 for Heavy Fuel Oil (HFO) as this was defined by IMO (*MEPC.1/Circ.684*).

**a) China - Richards Bay - Sailing speed: 14 knots**

| Voyage Route | Distance Loaded [miles] | Days | FOC sailing [mt] | FOC Port / Idle [mt] | total FOC [mt] | CO2 emissions [mt] | Cargo weight [mt] |
|---|---|---|---|---|---|---|---|
| Round voyage | 7498 | 44.63 | 47 | 40 | 2137.61 | 6656.5 | 160000 |

**b) China - Indonesia - India - Richards Bay: 10 knots**

| Voyage Route | Distance Loaded [miles] | Days | FOC sailing [mt] | FOC Port / Idle [mt] | total FOC [mt] | CO2 emissions [mt] | Cargo weight [mt] |
|---|---|---|---|---|---|---|---|
| Triangle voyage - Leg 1 (China to Indonesia and India) | 2440 | 22.5 | 23 | 40 | 557.5 | 1736.1 | 160000 |
| Triangle voyage - Leg 2 (India to Richards Bay and to China) | 7498 | 49.1 | 23 | 40 | 1169.0 | 3640.3 | 160000 |

The Emissions Index is calculated basis the distance between cargo load and discharge ports.

The denominator includes only the miles for the loaded legs of the voyages (actual miles cargo was transported) but the nominator includes the total emissions for both loaded and ballast legs.

$$Emissions\ Index_{round} = \frac{6656.5}{7498 * 160000} = 5.55 \qquad [grCO_2/tonnemile]$$

$$Emissions\ Index_{triangle} = \frac{1736.1 + 3640.3}{2440 * 160000 + 7498 * 160000} = 3.38 \quad [grCO_2/tonnemile]$$

Basis the calculation the round voyage will produce 60% more emissions than the triangle voyage. The optimisation achieved through the triangle voyage is by utilising the long ballast leg from China to Richard's Bay.