INTERNATIONAL MARITIME ORGANIZATION

E

MARINE ENVIRONMENT PROTECTION COMMITTEE 76th session Agenda item 7	MEPC 76/7/8 10 March 2021 Original: ENGLISH Pre-session public release: ☒

REDUCTION OF GHG EMISSIONS FROM SHIPS

Comprehensive Impact Assessment on States (Establishment of the International Maritime Research and Development Board and the IMO Maritime Research Fund)

Submitted by Denmark, Georgia, Greece, Japan, Liberia, Malta, Nigeria, Palau, Singapore, Switzerland, ICS, BIMCO, INTERTANKO, CLIA, INTERCARGO, IPTA, IMCA, INTERFERRY and WSC

SUMMARY

Executive summary:	MEPC 75 considered the proposal in document MEPC 75/7/4 to accelerate R&D of low and zero-carbon technologies to help ensure delivery of the levels of ambition in the Initial IMO Strategy. In response to the Committee's invitation for further commenting documents and other proposals, document MEPC 76/7/7 has been submitted to this session proposing, inter alia, a comprehensive package of proposed draft amendments to MARPOL Annex VI to establish an International Maritime Research and Development Board and an IMO Maritime Research Fund. This document provides an accompanying comprehensive impact assessment for that proposal.
Strategic direction, if applicable:	3
Output:	3.2
Action to be taken:	Paragraph 8
Related documents:	MEPC 76/7/7; resolution MEPC.304(72); MEPC 75/18, MEPC 75/7/4, MEPC 75/INF.5; ISWG-GHG 5/4/4; MEPC.1/Circ.885 and MEPC 71/7/4

Introduction

1 MEPC 75 considered a proposal co-sponsored by several industry associations for the development of a research and development (R&D) programme to accelerate the introduction of low-carbon and zero-carbon technologies and fuels, as set out in document MEPC 75/7/4 (ICS et al.).

2 The Committee noted that the proposed R&D programme would rely on the establishment by the Organization of an International Maritime Research and Development Board (IMRB) – which is already listed in the *Initial IMO Strategy on reduction of GHG emissions from ships* (Initial IMO GHG Strategy) as a short-term candidate measure – with responsibility for commissioning, coordinating, and administering specific R&D projects, to be financed by a fund (IMO Maritime Research Fund, IMRF) to be established by the Organization. This would be expected to raise approximately $5 billion over the 10 to 15 years life of the programme via a proposed mandatory R&D contribution equivalent to $2 per tonne of fuel oil consumed, using the mechanism already established by MARPOL Annex VI for the Fuel Oil Consumption Data Collection System.

3 The Committee held an extensive discussion about the IMRB proposal in which considerable support was expressed by many delegations, with many noting the urgent need for R&D to support global efforts to decarbonize the international shipping sector.

4 Subsequently, the Committee invited interested Member States and international organizations to submit further commenting documents and other proposals. In response to this request, document MEPC 76/7/7 has been submitted to this session.

Comprehensive impact assessment of the IMRB

5 A number of Member States indicated at MEPC 75 that a comprehensive assessment of the impact on States of the IMRB would need to be conducted before they could support the proposal.

6 The co-sponsors fully agree on the need for such an assessment in accordance with paragraphs 4.10 to 4.13 of the Initial IMO GHG Strategy and have conducted such an assessment which is set out in the annex to this document.

7 This comprehensive impact assessment, which has been produced with the assistance of Clarksons Research, conclusively confirms that the IMRB proposal will have no disproportionately negative impact on States, including LDCs and SIDS, and States that are geographically distant from their markets.

Action requested of the Committee

8 The Committee, when considering the proposed draft amendments to MARPOL Annex VI as set out in document MEPC 76/7/7, is invited to consider the accompanying comprehensive impact assessment on States as set out in the annex to this document, and take action as appropriate.

***

ANNEX

COMPREHENSIVE IMPACT ASSESSMENT ON STATES

Introduction

1 Document MEPC 75/7/4 (ICS et al.) contained a proposal to establish an International Maritime Research and Development Board (IMRB) which included, in annex 2, an Initial Impact Assessment on States. A number of Member states indicated at MEPC 75 that a comprehensive assessment of the impact of the IMRB on States would need to be conducted before they could support the proposal.

2 The co-sponsors agree on the need for such an assessment in accordance with sections 4.10 to 4.13 of the Initial IMO GHG Strategy, and have conducted the following comprehensive impact assessment of the modified proposal which takes account of the issues raised by Member States at MEPC 75 and which proposes an R&D contribution, to be made by ships, equivalent to the tonnes of CO_2 emitted and calculated at a cost of $2 per tonne of fuel oil consumed, with a reduced value and rate for fuels with a lower carbon intensity.

3 The following impact assessment on States is consistent with the guidance on comprehensive impact assessments contained in MEPC.1/Circ.885. As required by paragraph 15 of this procedure, this assessment pays particular attention to the needs of developing countries, especially SIDS and LDCs, and includes, inter alia: a description of the assumptions and methods used in the analysis; a detailed qualitative and/or quantitative assessment of specific negative impacts on States; and an assessment of whether the measure is likely to result in disproportionately negative impacts. As the analysis does not identify any disproportionately negative impacts on States it does not suggest any recommendations on how any such impacts could be addressed.

4 The following impact assessment has been prepared with the assistance of Clarksons Research and focuses on the impact on States of the proposed R&D contribution equivalent to $2 per tonne of fuel oil consumed, the value and rate of which would be established by an MEPC resolution as set out in annex 3 of document MEPC 76/7/7.

Clarksons Research

5 Clarkson Research Services Limited (Clarksons Research) is a leading provider of maritime trade data and intelligence. Its clients include UNCTAD to which Clarksons Research provides shipping data used to help compile the annual *UNCTAD Review of Maritime Transport.* As part of the Clarksons Group which, inter alia, provides shipbroking and financial services to all sectors of the global shipping industry, Clarksons Research has access to authoritative information on all aspects of shipping including extensive trade and commercial data.

6 Whilst Clarksons Research has been contracted to assist with the preparation of data used in this impact assessment, this constitutes neither an endorsement nor recommendation by Clarksons Research of the specific policies or strategies advocated by the co-sponsors with respect to this regulatory proposal. See also Clarksons Research's disclaimer in the appendix.

The Measure

7 This measure concerns the establishment of an International Maritime Research and Development Board (IMRB) to accelerate the development of low-carbon and zero-carbon technologies for marine application, to be financed by a mandatory R&D contribution equivalent to $2 per tonne of fuel oil to be made by ships of 5,000 GT and above to an IMO Maritime Research Fund (IMRF).

8 The measure, if adopted, would be implemented by a package of instruments to MARPOL Annex VI which, as set out in annexes 1 to 4 of MEPC 76/7/7 includes:

.1 draft amendments to MARPOL Annex VI to add, inter alia, a new Chapter 6 "Research and Development of Low-Carbon and Zero-Carbon Technologies for Maritime Application";

.2 draft "Guidelines for the establishment and governance of the International Maritime Research Board and collection of R&D contributions made to the IMO Maritime Research Fund under Chapter 6 of MARPOL Annex VI";

.3 draft MEPC resolution and annex "R&D Contribution to the IMO Maritime Research Fund"; and

.4 revised Draft Charter for the Establishment and Governance of the International Maritime Research and Development Board.

The Proposals

9 The proposed R&D programme would rely on the establishment by the Organization of an International Maritime Research and Development Board (IMRB) – which is already listed in the Initial IMO Strategy as a short-term candidate measure – with responsibility for commissioning, coordinating, and administering specific R&D projects, to be financed by an IMO Maritime Research Fund (IMRF) to be established by the Organization. This would be expected to raise approximately $5 billion over the 10 to 15 years' life of the programme via a proposed mandatory R&D contribution equivalent to the tonnes of CO_2 emitted and calculated at a cost of $2 per tonne of fuel oil consumed, using the mechanism already established by MARPOL Annex VI for the IMO Fuel Oil Consumption Data Collection System.

10 The IMRB and its coordinated R&D programmes would accelerate the development of low-carbon and zero-carbon emission technologies and fuel systems that are specifically tailored for maritime application, especially for larger transoceanic ships which keep all States, including developing countries, LDCs and SIDS, connected to global markets. The IMRB, and the specific R&D programmes it would support, are expected to help deliver substantial GHG reductions from international shipping in the mid to long-term, at a faster rate than would otherwise be possible should this proposal not be taken forward by the Organization.

11 The underlying purpose of the proposal is to ensure, through the acceleration of R&D of low and zero-carbon technologies suitable for maritime application, that the world economy, including the economies of LDCs and SIDS, will continue to have access to efficient and low cost maritime transport, notwithstanding the requirement of international shipping to meet the ambitious GHG reduction targets set by the Initial IMO GHG Strategy.

12 LDCs and SIDS are particularly vulnerable to the consequences of dangerous climate change. By helping the international shipping sector to decarbonize as soon as possible, this proposal will be of significant benefit to LDCs and SIDS, contributing to the goal agreed by UNFCCC State Parties of reducing global GHG emissions to the levels required so that average global temperatures do not increase by more than 1.5 degrees Celsius.

13 Document MEPC 75/INF.5 (ICS et al.) provides an analysis entitled *Zero-carbon fuels acceleration* carried out by Ricardo on what R&D activities could be undertaken with $5 billion funding over the life of the IMRB, considering technical issues associated with zero-carbon technologies and the need to increase Technology Readiness Levels (TRLs), providing example R&D case studies of projects which could be required and illustrating the breadth of

projects which the IMRB and the IMRF could support to help achieve the levels of ambition agreed by the Organization in the Initial IMO Strategy. The objectives and activities of the IMRB would be governed by a Charter for the Establishment and Governance of the IMRB that would be approved by the Organization and overseen by MEPC.

14 The proposal seeks to minimise the administrative burden on flag States by linking the R&D contribution to be made to the IMRF to the fuel oil data which ships are already required to submit to Administrations for the IMO Fuel Oil Data Collection System, and by placing most of the tasks necessary to ensure compliance with the IMRF rather than with flag States. Each ship – not the flag State – will be required to provide the IMRF with fuel oil consumption data as already reported to the Administration, or any organization duly authorized by it, in accordance with regulation 22A.3 of MARPOL Annex VI.

15 The co-sponsors propose that the IMRF will be responsible, inter alia, for determining the R&D contribution to be made by each ship, the collection and processing of the R&D contribution, and the issuance of an IMRF Annual Account Statement to confirm that the total R&D contribution to be made to the IMRF for that ship for the previous calendar year has been made.

16 The only responsibility of the flag State (or other organisation to which this responsibility has been delegated) will be to confirm that the annual figure for fuel oil consumed as shown on the IMRF Annual Account Statement matches the fuel oil consumption data as reported to the Administration (or any organization duly authorized by it) in accordance with regulation 22A.3 and issuing a statement of compliance to each ship registered with the flag State.

Assumptions and methods used in the analysis

17 To assess whether or not the impact on States would be disproportionately negative if, as proposed, the R&D contribution is fixed at $2 for the equivalent of one tonne of marine fuel oil consumed, Clarksons Research used its comprehensive database of time series data related to commercial shipping markets, including bunker prices, freight rates and time charter rates, to test the assumption contained in the initial impact assessment that $2 per tonne would fall within the normal daily price variability of marine fuel oil.

18 Geographic remoteness and connectivity to main markets is a subjective topic, as any transoceanic voyage implies that the exporting State is distant from its market. Clarksons Research therefore examined in detail the impact on States of a $2 R&D contribution on a number of different voyages and cargoes. These include:

.1 impact on iron ore freight rates and prices – Australia to China (3,500 miles);

.2 impact on iron ore freight rates and prices – Brazil to China (11,500 miles);

.3 impact on containerised perishables trade – East Coast South America via South Africa to Asia (Liner Service with multiple port calls);

.4 impact on coal freight rates and prices – India to South Africa (5,000 miles);

.5 impact on crude oil freight rates and prices – Middle East Gulf to China (5,800 miles);

.6 impact on petroleum products freight rates and prices – Singapore to Australia (4,500 miles); and

.7 impact on petroleum products freight rates and prices – Singapore to Fiji (4,700 miles).

19 Clarksons Research then applied the standard vessel and voyage assumptions which it uses for its commercial clients to test the argument that the impact on States of a $2 R&D contribution would be minimal, with no disproportionately negative impact on States.

20 According to UNCTAD, developing countries, especially in Africa and Oceania, pay 40 to 70% more on average for the international transport of their imports than developed countries.[1] When assessing the impact of a $2 R&D contribution on the economies of LDCs and SIDS, it is therefore assumed, as established by UNCTAD, that freight rates are generally higher for LDCs and SIDS, especially those that may be more remote from their markets, due, among other factors, to the higher bunker prices in their ports[2] and the reduced number of maritime services to which they have access.[3] The impact of a $2 R&D contribution per tonne of fuel oil on freight rates, price of cargo on delivery and GDP would not therefore be proportionately greater for LDCs and SIDS than the examples of voyages investigated in detail for this impact assessment.

21 The proportionate impact of a $2 R&D contribution per tonne of fuel oil on the economies of LDCs and SIDS can be seen not to be greater, compared to the voyages analysed by Clarksons Research in detail, when account is taken of the non-maritime cost component of the cargo movement. As shown by various reports by UNCTAD and the World Bank[4], the costs of land-based transportation are typically higher in LDCs and SIDS. According to UNECE, landlocked LDCs have transport costs which are on average 50% higher than developing countries that have access to the open sea. If containerized imports are considered, landlocked LDCs have costs that are 85% higher than the world average[5]. Many LDCs and SIDS also have higher maritime transportation costs due to higher incidence of non-tariff barriers to maritime trade.[6]

22 An example of a voyage to a Pacific island State (Singapore-Fiji) has been analysed for completeness. Using the assumptions above, however, the other voyage examples analysed by Clarksons Research – where the $2 R&D contribution per tonne of fuel oil represents a larger proportion of freight rates than is the case for most voyages to and from LDCs and SIDS – are deemed sufficient to assess whether or not the impact on LDCs and SIDS would be disproportionately negative.

Detailed qualitative and/or quantitative assessment of specific negative impacts on States

23 The principal potential negative economic impact on States of this proposal concerns the effect of a mandatory $2 R&D contribution on bunker fuel oil costs, freight rates, the price of shipped cargoes to consumers, and the impact on States' economies and GDP.

---

1 UNCTAD (2015) Chapter 3: Freight Rates and Maritime Transport Costs, RMT 2015.

2 Oil Monster https://www.oilmonster.com/bunker-fuel-prices/middle-east-and-africa/42;

3 UNCTAD Liner Shipping Connectivity Index (2020).

4 https://unctad.org/meeting/launch-global-transport-costs-database-unctad-and-world-bank

5 https://unece.org/DAM/trans/doc/2019/wp5/id_WP5-19_02e.pdf

6 *Protectionism in Maritime Economies (PRIME Index)* Harvard Kennedy School of Government https://www.ics-shipping.org/wp-content/uploads/2021/02/Protectionism-in-Maritime-Economies-Study-Summary-Report-1.pdf

Daily price variability of fuel oil costs, including costs to LDCs and SIDS

24 Clarksons Research has confirmed, through quantitative analysis, that the cost of the $2 R&D contribution falls within the typical daily variability of marine fuel oil bunker prices. This means that the impact on bunker costs, freight rates and the cost to economies and consumers of goods and products carried by sea will be minimal, to the extent that it would be scarcely perceptible to shipping companies' customers, and hardly perceptible at all by consumers in States' economies, confirming that there would be no disproportionately negative impact on States.

25 Clarksons Research has determined that, over the past 10 years, the average week-on-week movement in bunker prices has been around $18 per tonne (based on HSFO bunkered in Singapore). This again implies that the impact on price of a $2 R&D contribution would have a negligible impact on States representing just 11% of the average week-on-week variation.

26 During 2020, the largest week-on-week increase in the cost of VLFSO was $53 per tonne, in contrast to the proposed $2 increase which would fund the IMRB's programme over a 10 to 15 year period. To put the impact of a $2 R&D per tonne increase in marine fuel oil prices into context, the price of VLSFO fuel (which is the grade of fuel now used by most ships to comply with the IMO 2020 0.5 % global sulphur cap requirements) varied by around $400 - $500 per tonne over the course of 2020 alone.

27 The implementation of IMO 2020, plus the impact of COVID-19, arguably means that 2020 was not a typical year. Nonetheless, data from Clarksons Research demonstrates that marine fuel prices have been similarly volatile over the past 10 years, with the cost of HFSO (which most ships were still using before 2020) varying by around $600 per tonne during the course of the decade.

28 Given that $2 falls within the daily fuel price variability of marine fuel oil, and that the average week-on-week change is almost ten times the level of the proposed R&D contribution, the impact on States, including LDCs and SIDS, would be negligible and not disproportionately negative.

Variation in bunker prices between different port locations, including main bunkering hubs and ports in LDCs

29 The negligible impact on States of a $2 R&D per tonne increase in fuel oil costs can also be seen when taking account of the variation in marine fuel oil prices, at any given time, between different ports around the world, including ports located in LDCs.

30 Throughout the last decade, the average difference in cost of HSFO on any given day varied by about $30 between Singapore and Rotterdam.

31 In the middle of January 2021, the range in bunker prices between four key bunkering hubs (Singapore, Fujairah, Rotterdam and Houston) was $32 per tonne of VLSFO. The average range between these ports in 2020 was $63 per tonne of VLSFO.

32 In early February 2021, the cost per tonne of VLSFO was $472 in Hamburg, $467 in Rotterdam and $454 in St. Petersburg. In Dakar (Senegal), Djibouti and Tema (Benin) [7] the cost respectively was $523, $534 and $563, showing how the bunker price variation between European ports and ports in African LDCs is typically greater than between ports in developed

[7] https://www.oilmonster.com/bunker-fuel-prices/middle-east-and-africa/42;

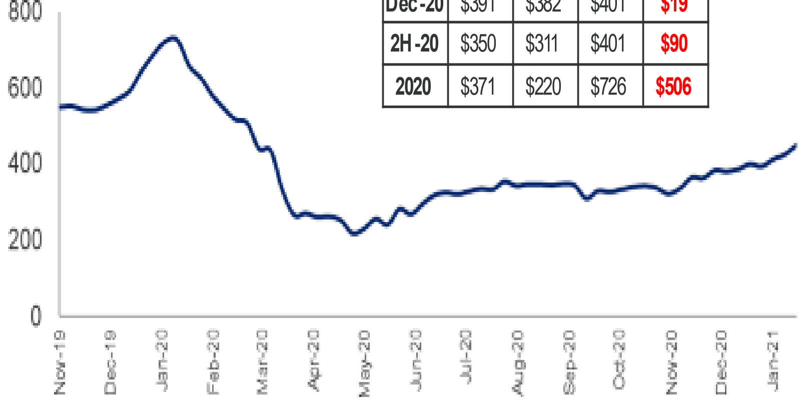
nations, and thus the impact of the $2 R&D contribution is not proportionately any greater for these LDCs. Given that the typical variation between the cost of marine fuel oil between key ports is between 15 and 30 times more than the proposed R&D contribution of $2 per tonne, the impact on States, including LDCs and SIDS, would be negligible and would be not be disproportionately negative.

33 Graphics produced by Clarksons Research illustrating marine fuel oil price volatility (short term and long term) are shown in figure 1 and figure 2.

Bunker Price Volatility: Short Term View

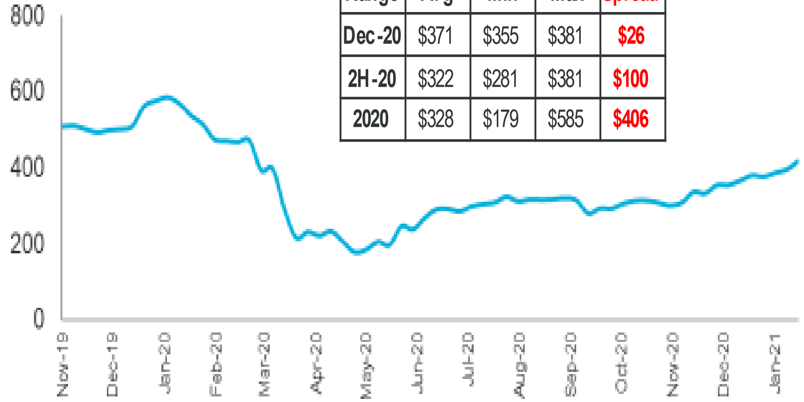
VLSFO* fuel price varied by c.$400 -$500/t over the course of 2020 alone

Singapore $/tonne



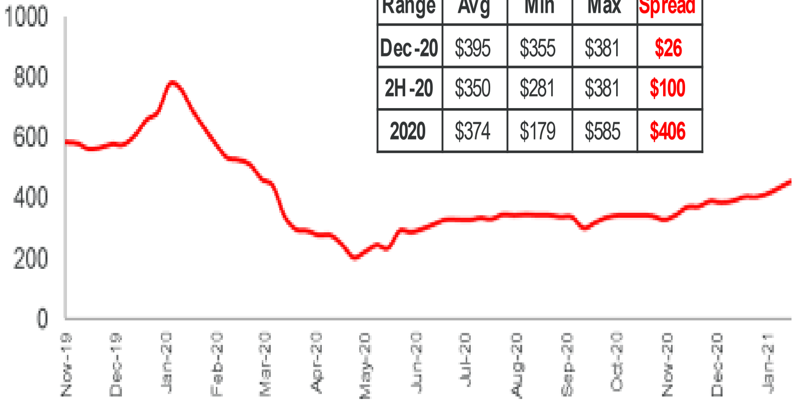
Range	Avg	Min	Max	Spread
Dec-20	$391	$382	$401	$19
2H-20	$350	$311	$401	$90
2020	$371	$220	$726	$506

Rotterdam $/tonne



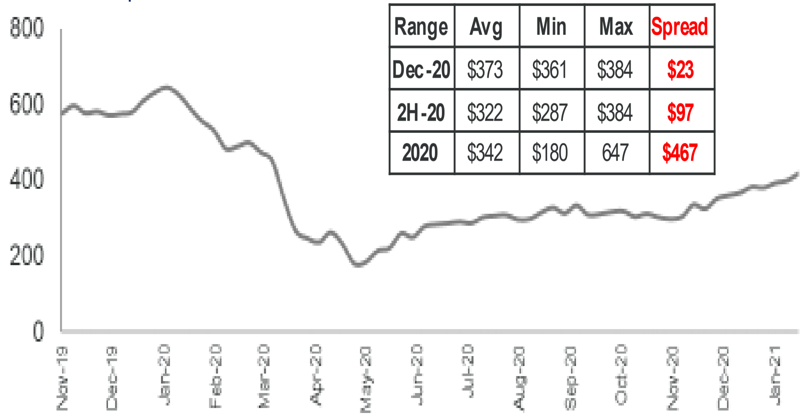
Range	Avg	Min	Max	Spread
Dec-20	$371	$355	$381	$26
2H-20	$322	$281	$381	$100
2020	$328	$179	$585	$406

Fujairah $/tonne



Range	Avg	Min	Max	Spread
Dec-20	$395	$355	$381	$26
2H-20	$350	$281	$381	$100
2020	$374	$179	$585	$406

Houston $/tonne



Range	Avg	Min	Max	Spread
Dec-20	$373	$361	$384	$23
2H-20	$322	$287	$384	$97
2020	$342	$180	647	$467

Source: Clarksons Research. *VLSFO = "Very Low Sulphur Fuel Oil"; bunker fuel grade with maximum 0.5% sulphur content. VLSFO has been the main fuel grade consumed by merchant vessels since the start of 2020, following the introduction of the 'IMO 2020' 0.5% global sulphur cap, limiting the maximum sulphur content of marine fuel to 0.5% globally for any vessel not equipped with emissions abatement technology.

Clarksons Research

Bunker Price Volatility: Longer -Term View

HSFO fuel prices varied by c.$600/t over the last 10 years, and c.$200/t in the last year alone

Singapore $/tonne

Range	Avg	Min	Max	Spread
1 yr	$270	$158	$388	$230
5 yr	$333	$148	$518	$370
10 yr	$442	$148	$742	$594

Rotterdam $/tonne

Range	Avg	Min	Max	Spread
1 yr	$246	$125	$304	$179
5 yr	$302	$112	$478	$112
10 yr	$414	$112	$720	$608

Fujairah $/tonne

Range	Avg	Min	Max	Spread
1 yr	$256	$129	$328	$199
5 yr	$324	$129	$530	$401
10 yr	$439	$129	$752	$623

Houston $/tonne

Range	Avg	Min	Max	Spread
1 yr	$258	$121	$362	$241
5 yr	$310	$100	$473	$373
10 yr	$422	$100	$731	$631

Source: Clarksons Research. *HSFO = "High Sulphur Fuel Oil", bunker grade with a maximum 3.5% sulphur content. HSFO was the main bunker fuel in the shipping industry prior to start 2020, but is now mainly consumed by merchant vessels equipped with SOx scrubber technology.

Clarksons Research

34 Graphics produced by Clarksons Research illustrating significant historical volatility in prices across key bunker grades and port locations are shown at figure 3 and figure 4.

Figure 3

Bunker Price Volatility: Summary

Significant historical volatility across key bunker grades and port locations

Bunker Price, $/tonne

Port	Fuel	2020 Min	2020 Max	2020 Avg	5yr Avg	10yr Avg	20yr Avg
Singapore	HSFO	158	388	270	333	442	368
	VLSFO	220	726	371			
	MGO	232	728	391	504	666	575
Rotterdam	HSFO	125	304	246	302	414	343
	VLSFO	179	585	328			
	MGO	212	600	366	481	646	568
Fujairah	HSFO	129	328	256	324	439	366
	VLSFO	203	776	374			
	MGO	329	796	480	592	762	644
Houston	HSFO	121	362	258	310	422	351
	VLSFO	180	647	342			
	MGO	225	683	390	519	709	705

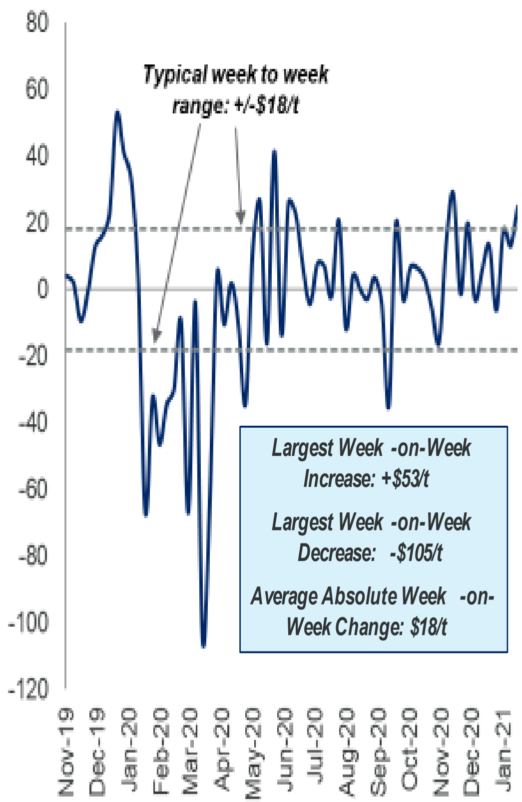
Source: Clarksons Research. HSFO = "High Sulphur Fuel Oil", bunker grade with a maximum 3.5% sulphur content. HSFO was the principal bunker fuel in the shipping industry prior to start 2020, but is now mainly consumed by merchant vessels equipped with SOx scrubber technology. VLSFO = "Very Low Sulphur Fuel Oil"; bunker fuel grade with maximum 0.5% sulphur content. VLSFO has been the main fuel grade consumed by merchant vessels since the start of 2020, following the introduction of the 'IMO 2020' 0.5% global sulphur cap, limiting the maximum sulphur content of marine fuel to 0.5% globally for any vessels not equipped with emissions abatement technology. MGO = Marine Gas Oil.

Clarksons Research

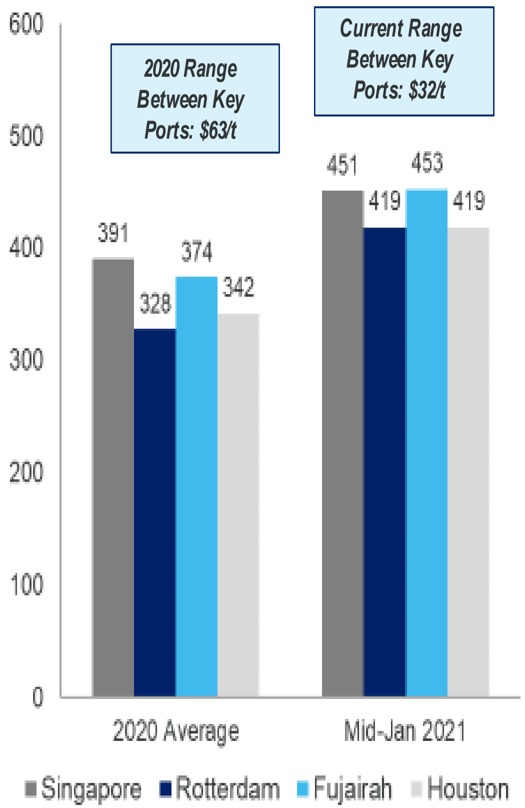
Bunker Price Impact of USD 2 per tonne R&D Contribution

Price volatility; already wide spread between key ports; additional $2/t increases prices by 0.6%

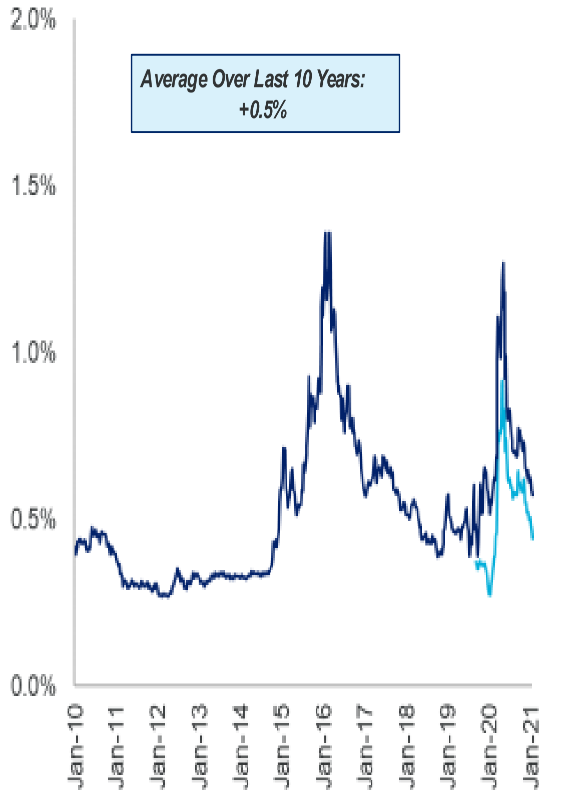
Sing. VLSFO Price, Weekly Change, $/t



VLSFO Bunker Prices, $/tonne



% Impact Of +$2/t On Singapore Bunker Price



Source: Clarksons Research

Clarksons Research

Impact on iron ore trades

35 Clarksons Research has conducted a detailed analysis of the impact of a $2 R&D contribution on iron ore trades.

36 This includes analysis of the impacts on States whose iron ore industries are more geographically remote from their key markets than their competitors, comparing the impacts on the iron ore trades between Brazil and China (voyage length about 11,000 miles) and Australia and China (voyage length about 3,500 miles).

37 To conduct this analysis, Clarksons Research used its standard vessel and voyage assumptions for a Capesize bulk carrier built in 2010, consuming 43 tonnes of fuel oil per day at 12 knots laden, 13 knots ballast. The figures used include estimates for consumption in port and on the ballast leg (round voyage assumed on both routes).

38 The calculations used for Brazil-China are based on an iron ore cargo of 177,000 tonnes from Tubarao to Qingdao, and for Australia-China are based on iron ore cargo of 172,000 tonnes from Dampier to Qingdao.

39 With respect to the Brazil-China route, Clarksons Research calculates that the additional cost of the voyage (round trip) arising from an R&D contribution of $2 per tonne of fuel oil would amount to $6,773, which is equivalent to about $0.038 per tonne of iron ore shipped.

40 With respect to the Australia-China route, Clarksons Research calculates that the additional cost of the voyage (round trip) arising from an R&D contribution of $2 per tonne of fuel would amount to $2,237 which is equivalent to about $0.013 per tonne of iron ore shipped.

41 As a result of the $2 R&D contribution, the cost of transporting iron ore by sea from Brazil to China would thus be about 2.5 cents more expensive per tonne than for iron ore shipped to China from Australia.

42 During 2020, global iron ore prices averaged at $109 per tonne, which means that the additional cost of the $2 R&D contribution on the Brazil-China route, compared to the Australia-China route, would currently amount to about 0.02% of the value of the iron ore. This would have a negligible impact on the relative competitiveness of these trades without any disproportionately negative impact on States.

43 The negligible impact on States should also be seen in the context of the considerable volatility in the delivery price in China of iron ore, which in February 2021 was about $150 per tonne compared to the lowest price on delivery in China of $40 during the past 5 years (as well as in the context of the volatility in marine fuel oil prices explored above).

44 Clarksons Research have analysed iron ore freight rates and delivered cargo costs over a 10 year period and concluded that because freight rates and cargo prices are already highly volatile, the estimated delivered cost impact would be limited to less than 0.05%.

45 The estimated cost impact (of the $2 R&D contribution) of $0.038 per tonne for the Brazil-China voyage compares to a freight rate range of $16 per tonne over 2020 alone and $27 per tonne over the past 10 years. The estimated cost impact of $0.013 per tonne for the Australia-China voyage compares to a freight rate range of $7 per tonne over 2020 alone and $11 per tonne over the previous 10 years.

46 Based on spot market iron ore freight rates, averaged over a 10 year period (2010 - 2020), Clarksons Research calculates that the cost of the R&D contribution would amount to about 0.3% of the freight rate on the Brazil-China route and about 0.2% on the Australia-China route.

47 With respect to the price of delivered iron ore in China, Clarksons Research has analysed these over a 10 year period (2010-2020). This analysis demonstrates that the estimated cost impact of $0.038 per tonne (Brazil -China) or $0.013 per tonne (Australia – China) would not have a disproportionately negative impact on States compared to an iron ore price variation of $70 per tonne of iron ore during 2020 and a price variation of $173 per tonne of iron ore over the past 10 years.

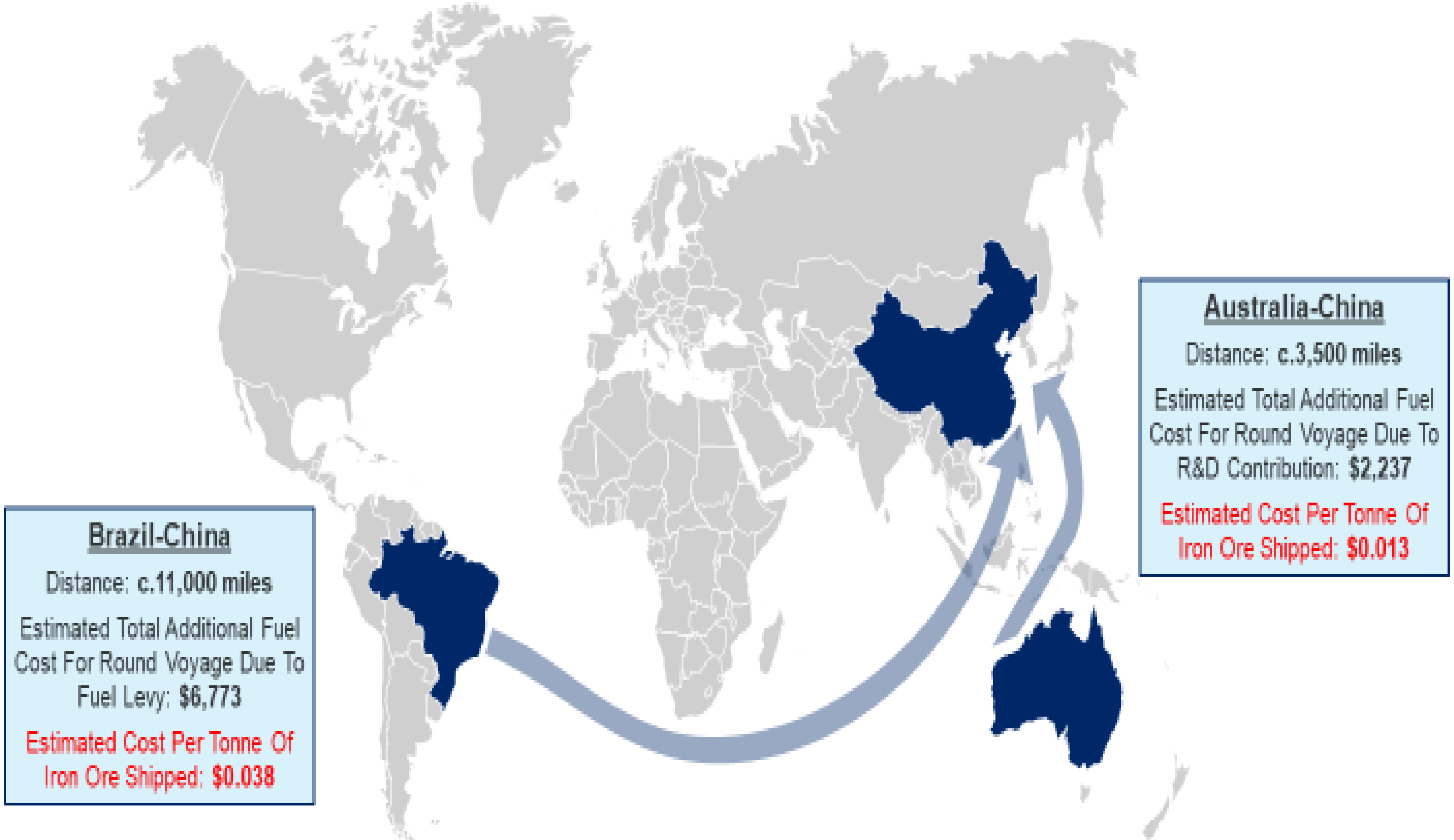
48 Clarksons Research calculates that the impact of the $2 R&D contribution on the delivered iron ore price would amount to about 0.04% (on the Brazil-China voyage) and 0.01% (on the Australia-China voyage) based on the average delivery price of iron ore over the past 10 years.

49 The impact of a $2 R&D contribution on States involved in iron ore trades would therefore be negligible, as would be the impact on those States more geographically remote from their markets (or their suppliers). The impact would not be disproportionately negative on States, including LDCs and SIDS, or other consumers throughout the supply chain that might be affected by the delivery price of iron ore.

50 Graphics produced by Clarksons Research illustrating data concerning Brazilian and Australian iron ore exports to China are shown at figure 5. Graphics illustrating the impact on iron ore freight rates and delivered cargo costs is shown at figure 6.

Impact Example: Brazilian & Australian Iron Ore Exports To China

Estimated impact of R&D contrib. equivalent to additional $0.038/t (Brazil-China) / $0.013/t (Aus-China)



Source: Clarksons Research. Estimated additional fuel cost due to $2/t R&D contribution basis standard vessel and voyage assumptions. Basis standard c.2010-built Capesize bulkcarrier, consuming 43 tonnes of fuel per day at 12 knots laden, 13 knots ballast. Figures include estimate for consumption in port and on ballast leg (round voyage assumed on both routes). Calculations for Brazil-China basis 177,000t cargo from Tubarao to Qingdao, and for Australia-China basis 172,000t from Dampier to Qingdao.

Clarksons Research

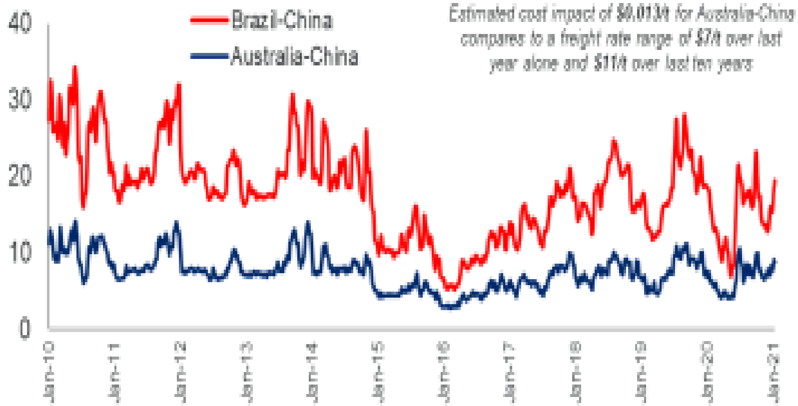
Impact On Iron Ore Freight Rates & Delivered Cargo Costs

Freight rates & cargo prices already highly volatile; estimated delivered cost impact limited to <0.05%

Iron Ore Spot Freight Rate $/tonne

Estimated cost impact of $0.038/t for Brazil-China compares to a freight range of $16/t over last year alone and $27/t over last ten years

Estimated cost impact of $0.013/t for Australia-China compares to a freight rate range of $7/t over last year alone and $11/t over last ten years



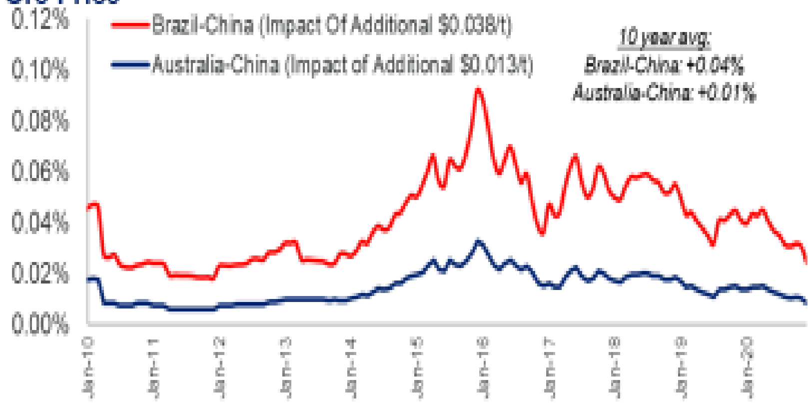
Estimated % Impact Of $2/t R&D Contribution On Iron Ore Freight Rate

Delivered Iron Ore Price In China, $/tonne

Range	Avg	Min	Max	Spread
1 yr	$109	$85	$155	$70
5 yr	$81	$41	$155	$114
10 yr	$105	$40	$213	$173

Estimated cost impact of $0.038/t or $0.013/t compares to an iron ore price of $70/t over last year alone and $173/t over last ten years

Estimated % Impact Of $2/t R&D Contribution On Delivered Iron Ore Price



Source: Clarksons Research

Clarksons Research

Impact on coal trades

51 Clarksons Research has conducted a detailed analysis of the impact of a $2 R&D contribution on coal trades, analysing freight rates for dry bulk carriers trading between South Africa and India (voyage length about 5,000 miles).

52 To conduct this analysis, Clarksons Research used its standard vessel and voyage assumptions for a 2010-built Panamax bulk carrier, consuming 23.5 tonnes of fuel oil per day at 12 knots laden, and 23 tonnes per day at 12.5 knots ballast. The figures include estimates for fuel consumption in port and on the ballast leg (round voyage assumed), and the calculations are based on 72,000 tonnes of coal being carried from Richards Bay (East Coast South Africa) to Mundra (West Coast India).

53 With respect to the Richards Bay to Mundra route, Clarksons Research calculates that the additional cost of fuel for the voyage (round trip) arising from an R&D contribution of $2 would per tonne amounts to $1,714, which is equivalent to an additional freight rate of about $0.02 per tonne of coal shipped.

54 Based on analysis of spot market freight rates for this voyage, this additional freight rate of $0.02 per tonne compares over a 10 year period (2010 - 2020) to a freight rate range of about $22 per tonne of coal transported, and range of $16 per tonne moved in 2020 alone.

55 Based on variations in freight rates over the past 10 years, the $2 R&D contribution would represent an increase to the average spot market freight rates of around 0.2%. The impact would therefore be negligible and would have no disproportionately negative impact on States.

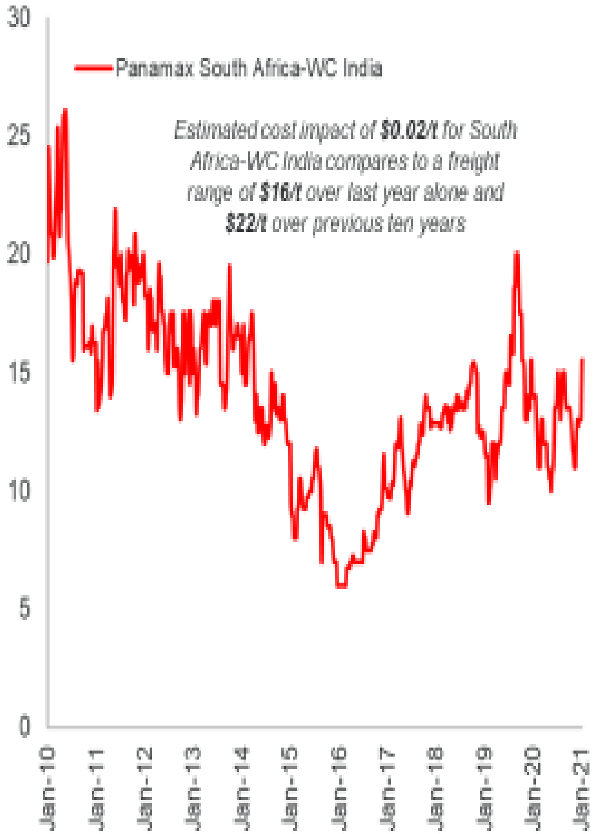
56 Based on the price of South African steam coal in December 2020 of $58 per tonne (FOB), Clarksons Research also calculates that the impact of the $2 R&D contribution on the delivered coal price on this voyage would amount to about 0.02%, which means that the impact on economies would be negligible and that the impact on States would not be disproportionately negative.

57 Graphics produced by Clarkson Research illustrating data on the impact on coal freight rates and prices for a voyage between South Africa and India are shown at figure 7.

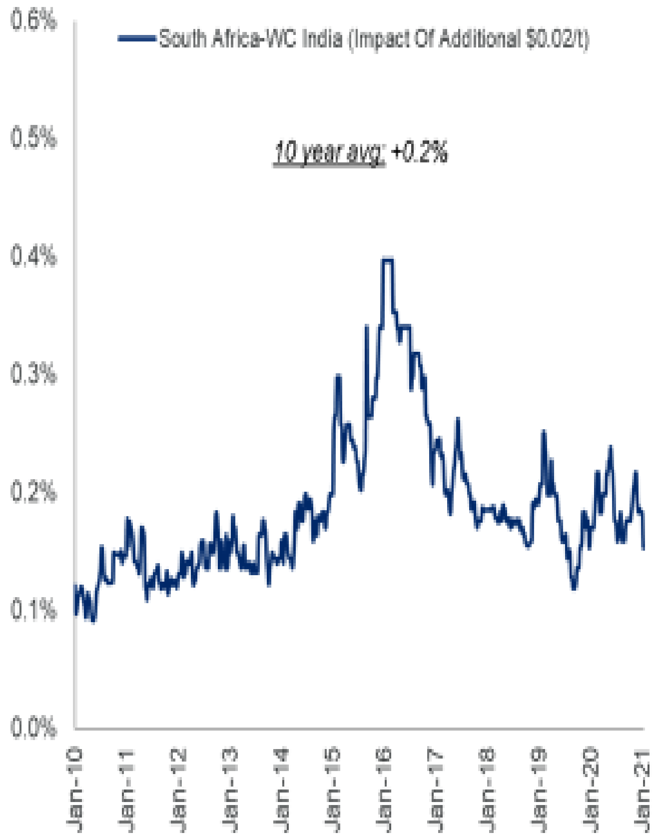
Impact On Coal Freight Rates & Prices

Example: South Africa to India

Panamax Bulker Spot Freight Rate $/tonne



Estimated % Impact Of $2/t R&D Contribution On Freight Rate



South Africa-India

Distance: **c.5,000 miles**

Estimated Total Additional Fuel Cost For Round Voyage Due To R&D contribution: **$1,714**

Estimated Cost Per Tonne Of Coal: $0.02

(South Africa steam coal FOB price stood at $58/t in Dec-20)

Source: Clarksons Research. Estimated additional fuel cost due to $2/t R&D contribution basis standard vessel and voyage assumptions. Basis standard c.2010-built Panamax bulkcarrier, consuming 23.5 tonnes of fuel per day at 12 knots laden, and 23 tonnes per day at 12.5 knots ballast. Figures include estimate for consumption in port and on ballast leg (round voyage assumed). Calculations basis 72,000t cargo from Richards Bay to Mundra.

Clarksons Research

Impact on container cargo (perishables)

58 Clarksons Research has conducted an analysis of the impact of a $2 R&D contribution on container liner services. To address questions about the impact on States geographically remote from their markets, Clarksons focused its detailed analysis on the East Coast South America (ECSA) via South Africa to Asia perishables trade.

59 To conduct this analysis, Clarksons Research used the following assumptions: 8,500 TEU modern, c.2010 built containership ship (homogenous @14t: 6,330 TEU) with a speed of 16 knots at sea, 32.3. days at sea (one-way voyage), 8.1 days in port (one-way voyage). Clarksons Research assumed 50% utilization of homogenous capacity (based on the estimated imbalance of cargo vs the return Asia-South America leg). The total fuel consumption for the one-way voyage including reefer consumption (assuming this comprised 10% of the cargo) was estimated to be 3,124 tonnes.

60 Clarksons Research calculates that the impact of the $2 R&D contribution would increase fuel costs for the voyage by £6,249. Assuming this cost was spread evenly across the cargo, this would amount to $1.97 per TEU. However, if capacity utilization was more than 50% (which is the case for many containerised liner trades) the cost impact of the R&D contribution per TEU would be lower.

61 Assuming that a TEU on this liner service contains 12 tonnes of perishable cargo, the additional cost of the R&D contribution per tonne of perishable cargo would amount to about 16 cents. For example, the additional cost of shipping a kilogramme of beef from South America to Asia would thus be about $0.00016.[8] Given that there are about 7,000 bananas per tonne (but only about 8 tonnes of bananas are typically carried in a refrigerated container[9]) the additional cost of the delivered cargo would amount to about $0.000036 per banana.[10] The additional cost of other perishable products would be similarly negligible with no disproportionately negative impacts on the economies of States.

62 Given that West Coast South America is a similar distance/voyage time from its Asian markets than East Coast South America, the impact of the $2 R&D contribution would be similarly negligible with no disproportionately negative impacts on the economies of States. While it is the case that the West Coast of South America is more geographically distant from markets in Western Europe than the East Coast of South America, the difference is virtually the same as that between these two coasts and their markets in the West Coast of the United States, to which the West Coast of South America is geographically closer. As can be seen by the examples of additional costs above, however, the impact in both cases would be negligible, with no disproportionately negative impacts on the economies of States.

63 Given that the value by weight and volume of most cargoes carried by containership is higher than that for most perishable cargoes, the impact of the R&D contribution on the price of these containerised cargoes, for consumers and States, will be lower still, with no disproportionately negative impacts on the economies of States.

64 A slide produced by Clarksons Research highlighting data on the impact on perishable container cargo on the East Coast South America to Asia liner trade is included at figure 8.

---

8 ICS calculation.

9 http://www.intelligentcontainer.com/fileadmin/Redakteure/pdfs/2013/BananaPaper_Draft_53.pdf

10 ICS calculation.

Impact of R&D Contribution on Container Cargo

Example: South America to Asia perishables trade

- Basis containership operating on ECSA via South Africa to Asia liner service
- 8,500 TEU (modern, c.2010 blt) ship (homogenous @14t: 6,330 TEU), 16 knots at sea
- 32.3. days at sea (one way), 8.1 days in port (one way)
- 50% utilization of homogenous capacity (basis estimated imbalance of cargo vs Asia -S.Am leg)
- Total fuel consumption including reefer consumption (basis c.10% of cargo) = 3,124 tonnes
- R&D contribution of $2/t would total $ 6,248
- Assuming levy spread equally across cargo, equivalent to $1.97 per TEU
- At 12t of cargo per box that 16 cents per tonne of perishable cargo
- Likely to be <0.2% of ocean freight rate across estimated range of likely market conditions (not highly transparent for reefer cargo)
- *Note: At higher levels of capacity utilization the impact of R&D contribution per TEU would be reduced.*

Data source: Clarksons Research standard vessel and voyage assumptions

Clarksons Research

Impact on Crude Oil Trades

65 Clarksons Research has conducted an analysis of the impact of a $2 R&D contribution on crude oil freight rates and prices.

66 Clarksons Research analysed in detail freight rates for VLCCs trading between the Middle East Gulf to Asia (voyage length about 5,800 miles).

67 To conduct this analysis, Clarksons Research used its standard vessel and voyage assumptions for a standard VLCC built in 2010, consuming 67 tonnes of fuel per day at 12.5 knots laden, and 51 tonnes per day at 12 knots ballast. The calculations include estimates for fuel oil consumption in port and on the ballast leg (round voyage assumed). The calculations are based on 270,000 tonnes of cargo being shipped from Ras Tanura to Ningbo. Freight rate data prior to August 2018 is based on Ras Tanura-Chiba.

68 Clarksons Research calculates that the additional cost of fuel for the voyage (round trip) arising from an R&D contribution of $2 per tonne would amount to $5,323, which is equivalent to an additional freight rate of about $0.02 per tonne of crude oil shipped.

69 Based on analysis of spot market freight rates for this voyage, this additional freight rate of $0.02 per tonne compares over a ten year period (2010 -2020) to a freight rate range of about $46 per tonne of crude oil transported, and a range of $41 per tonne shipped in 2020 alone. Based on the average freight rate for this voyage over the past 10 years, this would represent a 0.2% increase in the freight rate.

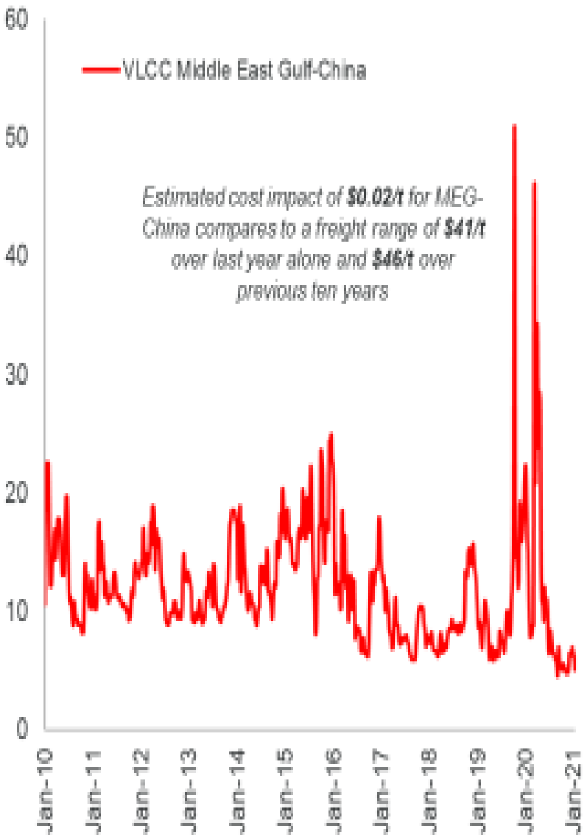
70 Based on the price of crude oil (Dubai price) in December 2020 of $49 per barrel, Clarksons Research also calculates that the impact of the $2 R&D contribution on the delivered crude oil price for this Middle East Gulf – Asia voyage would amount to about $0.003 per barrel, which means that the impact on economies would be negligible and that the impact on States would not be disproportionately negative.

71 Graphics produced by Clarksons Research highlighting data on the impact on crude oil freight rates and prices is included at figure 9.

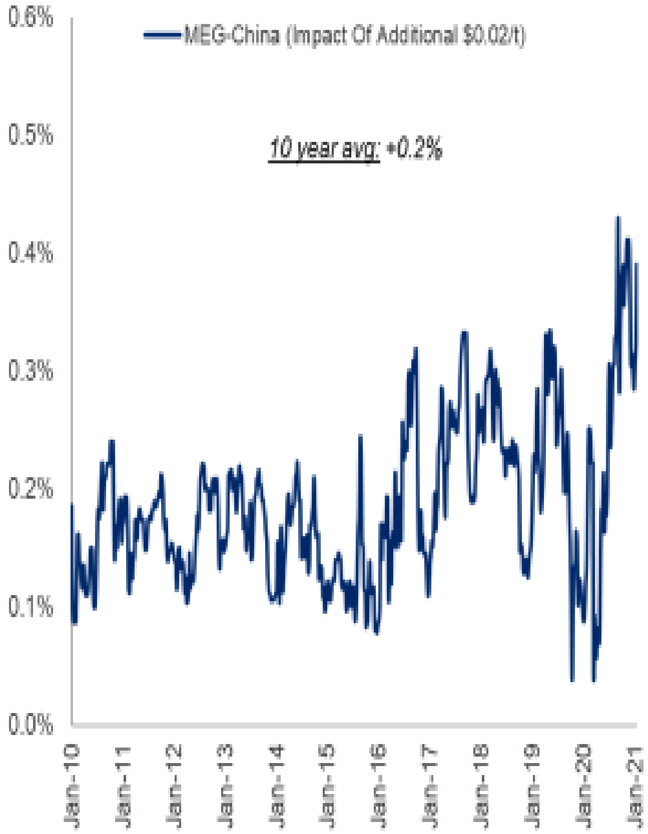
Impact On Crude Oil Freight Rates & Prices

Example: Middle East Gulf – China

Crude Tanker Spot Freight Rate $/tonne



Estimated % Impact Of $2/t R&D contribution On Freight Rate



Middle East Gulf-China

Distance: **c.5,800 miles**

Estimated Total Additional Fuel Cost For Round Voyage Due To R&D contribution : **$5,323**

Estimated Cost Per Tonne Of Crude Oil: **$0.02**

Estimated Cost Per Barrel Of Crude Oil: **$0.003/bbl** (Dubai oil price stood at $49/bbl in Dec-20)

Source: Clarksons Research. Estimated additional fuel cost due to $2/t R&D contribution basis standard vessel and voyage assumptions. Basis standard c.2010-built VLCC, consuming 67 tonnes of fuel per day at 12.5 knots laden, and 51 tonnes per day at 12 knots ballast. Figures include estimate for consumption in port and on ballast leg (round voyage assumed). Calculations basis 270,000t cargo from Ras Tanura to Ningbo. Freight rate data prior to August 2018 basis Ras Tanura-Chiba.

Clarksons Research

Impact on Petroleum Product Trades

72 Clarksons Research has conducted an analysis of the impact of a $2 R&D contribution on petroleum product freight rates and prices. Clarksons Research analysed freight rates for mid-range (MR) product tankers trading between Singapore and Sydney (voyage length about 4,500 miles).

73 To conduct this analysis, Clarksons Research used its standard vessel and voyage assumptions for a standard MR tanker built in 2010, consuming 27 tonnes of fuel per day at 12.5 knots laden, and 25 tonnes per day at 12 knots ballast. Figures include estimates for fuel oil consumption in port and on the ballast leg (round voyage assumed). Calculations are based on 35,000 tonnes of petroleum cargo.

74 Clarksons Research calculates that the additional cost of fuel for the voyage (round trip) arising from an R&D contribution of $2 per tonne would amount to $1,724, which is equivalent to an additional freight rate of about $0.049 per tonne of clean product shipped.

75 Based on analysis of spot market freight rates for this voyage, this additional freight rate of $0.049 per tonne compares over a 10-year period (2010 -2020) to a freight rate range of about $28 per tonne of clean product transported, and a range of $61 per tonne of cargo shipped in 2020 alone. Based on the average freight rate for this voyage over the past 10 years, this would represent a 0.2% increase in the freight rate.

76 Based on the price of clean product (Singapore FOB gasoline price in December 2020) of $53 per barrel, Clarksons Research also calculates that the impact of the $2 R&D contribution on the delivered crude oil price for this voyage would amount to about $0.006 per barrel.

77 The impact for the consumer purchasing gasoline would be $0.000036 per litre, which means that the impact on economies would be negligible and that the impact on States would not be disproportionately negative.

78 A graphic produced by Clarkson Research highlighting data concerning the impact on petroleum products freight and prices is included at figure 10.

Impact On Petroleum Products Freight Rates & Prices

Example: Singapore-Sydney

Clean Products Spot Freight Rate $/tonne

Estimated % Impact Of $2/t R&D Contribution On Freight Rate

Singapore-Sydney

Distance: **c.4,500 miles**

Estimated Total Additional Fuel Cost For Round Voyage Due To R&D contribution: **$1,724**

Estimated Cost Per Tonne Of Clean Products: **$0.049**

Estimated Cost Per Barrel Of Gasoline: **$0.006/bbl** (Singapore FOB gasoline price stood at $53/bbl in Dec-20)

Estimated Cost Per Litre Of Gasoline: **$0.000036/litre**

Source: Clarksons Research. Estimated additional fuel cost due to $2/t R&D contubution basis standard vessel and voyage assumptions. Basis standard c.2010-built MR tanker, consuming 27 tonnes of fuel per day at 12.5 knots laden, and 25 tonnes per day at 12 knots ballast. Figures include estimate for consumption in port and on ballast leg (round voyage assumed). Calculations basis 35,000t cargo.

Clarksons Research

Impact on Petroleum Product Trades (Pacific Island States)

79 In order to demonstrate the impact on SIDS, Clarksons Research has also conducted an analysis of the impact of a $2 R&D contribution on petroleum product freight rates and prices for mid-range (MR) product tankers trading between Singapore and Fiji (voyage length, one-way, about 4,700 miles), noting that 60 MR tanker callings were recorded in Fijian national waters in 2020.

80 To conduct this analysis, Clarksons Research used its standard vessel and voyage assumptions for a 2010-built 50,000 dwt vessel, consuming 27 tonnes of fuel oil per day at 12.5 knots laden, 25 tonnes of fuel oil per day at 12 knots ballast, plus an estimate for in port consumption. The cargo estimate for this example is 35,000 tonnes of clean product.

81 Clarksons Research calculates that the additional cost of fuel for the voyage (round trip) arising from an R&D contribution of $2 per tonne would amount to $1,800, which is equivalent to an additional freight rate of about $0.05 per tonne of clean product shipped.

82 This additional freight rate of $0.05 per tonne compares to a range of $61 per tonne of clean products shipped in 2020 (on the Singapore-Sydney route which is a similar length). Clarksons Research estimates this would represent a 0.2% increase on the freight rate in 2020.

83 Based on the price of clean product (Singapore FOB gasoline price in December 2020) of $53 per barrel, Clarksons Research also calculates that the impact of the $2 R&D contribution on cost of the delivered petroleum product in Fiji would be about 0.01%.

84 The impact for the consumer in Fiji purchasing gasoline would be $0.000038 per litre, which means that the impact on the economies of SIDS would be negligible and that the impact on SIDS would not be disproportionately negatively.

85 A slide produced by Clarksons Research highlighting data on the impact on petroleum products freight and prices (with respect to Fiji) is included at figure 11.

Impact On Petroleum Products Freight Rates & Prices

Example: Singapore -Fiji

- Basis MR products tanker on a round voyage from Singapore to Fiji*
- c.2010-built standard 50,000 dwt vessel, consuming 27 tpd at 12.5 knots laden, 25 tpd at 12 knots ballast, plus estimate for in port consumption
- Basis 35,000t cargo from Singapore to Fiji, one way distance c.4,700miles:
  - R&D contribution of $2/t would total $1,800/t
  - Equivalent to $0.05 per tonne of refined oil products shipped (for comparison freight rates on the Singapore - Sydney route have varied in a range of $61/t in last ten years)
  - Equivalent to $0.000038/ litre of refined oil products shipped (assuming gasoline)
  - Estimated impact of 0.2% on freight rate (basis Dec -20 average rate on the Singapore -Sydney route)
  - Estimated impact on delivered gasoline cost of 0.01% (basis Dec -20 Singapore FOB gasoline price)

Data source: Clarksons Research standard vessel and voyage assumptions. *Note: 60 MR tanker callings recorded in Fijian nati waters in 2020

Clarksons Research

Conclusions

86 For completeness, these conclusions follow the subheadings used for the initial impact assessment included with MEPC 75/7/4 based on the guidance contained in MEPC.1/Circ.885. As this comprehensive impact assessment does not identify any disproportionately negative impacts on States it does not suggest any recommendations on how any such impacts could be addressed.

Geographic remoteness and connectivity to main markets

87 The analysis provided above, and examples of voyages assessed, demonstrate conclusively that the impact of the $2 R&D contribution per tonne of fuel would be negligible for States, including LDCs and SIDS, with no disproportionately negative impacts.

88 For example, this would have little impact on overall freight and delivered costs for iron ore transported on a Capesize bulk carrier on both the Brazil-China and Australia-China routes. The estimated implied impact on a Brazil-China voyage equates to an additional $0.038 per tonne and $0.013 per tonne on an Australia-China voyage.

89 The proposal would have little overall impact on transportation costs of containerized items including foodstuffs. For example, a container moved on a c.8,500 TEU containership from East Coast South America via South Africa to Asia, the additional cost equates to around $1.97 per TEU, or about 16 cents per tonne (likely equivalent to less than 0.2% of the ocean freight rate across an estimated range of likely market conditions).

90 The proposal has only a marginal impact on overall freight and delivered costs for crude oil shipped on a VLCC from the Middle East Gulf to Asia, or refined oil products transported intra-Pacific on a MR products tanker. The impact on the Middle East Gulf to Asia voyage implies an additional $0.02 per tonne of crude or $0.003 per barrel, while for the Singapore-Sydney route the impact equates to an additional $0.049 per tonne (or about $0.0000036 per litre of gasoline).

91 As explained above, according to UNCTAD, developing countries, especially in Africa and Oceania, pay 40 to 70% more on average for the international transport of their imports than developed countries. An example of a voyage to a Pacific Island State (Singapore-Fiji) has been analysed for completeness and demonstrates no disproportionately negative impacts on States, including LDCs and SIDS. Moreover, the other voyage examples analysed by Clarksons Research – where the $2 R&D contribution per tonne of fuel oil represents a larger proportion of freight rates than is the case for most voyages to and from LDCs and SIDS – are sufficient to conclude that the impact on LDCs and SIDS would not be disproportionately negative.

Cargo value and type

92 As the proposed measure would apply to all ships (of at least 5,000GT and above) it would not discriminate between different cargoes.

93 The analysis provided above, to assess the impact on States that are geographically remote to their markets, provides examples of cargoes of a variety of values and types which demonstrates that the additional cost of fuel oil would be marginal and within the daily variability of marine fuel oil costs and would not have a disproportionately negative impact on States, including LDCs and SIDS.

Transport dependency

94 As demonstrated by the analysis above, the proposed measure will not disproportionately impact Member states which are dependent on maritime transport and – by accelerating R&D of low and zero- carbon technologies that will make decarbonization of the sector possible – it will allow these States to continue to enjoy access to low cost and efficient maritime transport whilst meeting the levels of ambition set by the Initial IMO Strategy, which will be particularly important for LDCs and SIDS.

Transport costs

95 As demonstrated by the analysis above, which includes data on the impact of the R&D contribution on freight rates, the proposed measure will not adversely impact transport costs to an extent beyond those impacts which already result from daily volatility of fuel oil prices. Moreover, the R&D programmes to be undertaken by the IMRB will be designed to identify potential mechanisms for reducing the cost of transportation to LDCs and SIDS, and other geographically remote locations, whilst complying with existing and future regulations that require a reduction in carbon intensity.

Food security

96 As demonstrated by the analysis above, the proposed measure will have no adverse impact on food security. The analysis above with respect to the impact on freight rates in dry bulk trades (iron ore and coal), which demonstrates that there will be no disproportionately negative impacts on States, is equally applicable to bulk carriers which are used to move key food stuffs in bulk, whilst the analysis above with respect to the trade of containerised perishable cargoes demonstrates that the proposed measure will have no disproportionately negative impacts on the transportation or food security of these products. The proposed measure, however, by facilitating the transition to zero-carbon shipping and contributing to the mitigation of dangerous climate change, will contribute to the long-term food security of all States.

Disaster response

97 The proposed measure will have no adverse impact on disaster response.

Cost-effectiveness

98 As demonstrated by the analysis above, the proposals would impose a negligible additional cost on marine fuel oil with commensurately negligible implications for freight rates, the cost of delivered cargoes, prices paid by consumers and with no disproportionately negative impacts on States.

99 The proposed measure will create a $5 billon IMO Maritime Research Fund to accelerate research and development of low-carbon and zero-carbon technologies, without any financial cost to States and minimal administrative burden. The proposed IMRB is therefore considered to be an extremely cost effective measure which will help facilitate successful delivery of the 2050 levels of ambition set out in the Initial IMO Strategy.

Socio-economic progress and development

100 The proposal will have no adverse impacts on socio-economic progress and development. To the contrary, by assisting global decarbonization efforts it will contribute to socio-economic progress and development, consistent with the UN SDGs for 2030.

Justification

101 LDCs and SIDS are particularly vulnerable to the consequences of dangerous climate change. By helping the international shipping sector to decarbonise as soon as possible, this proposal will be of significant benefit to LDCs and SIDS, contributing to the goal agreed by UNFCCC State Parties of reducing global GHG emissions to levels required so that average global temperatures do not increase by more than 1.5 degrees Celsius.

102 As asserted by the industry in MEPC 75/7/4, the absolute GHG reduction target for 2050, adopted as part of the Initial IMO Strategy, is unlikely to be achieved unless commercially viable zero-emission ships, including ships capable of trans-oceanic voyages, begin to appear on the market by 2030. This can only happen, within the timeline required by the Initial IMO Strategy, if there is a significant acceleration of R&D of zero-carbon technologies and – given that such technologies do not yet exist in a scale or form that can be readily applied to large ocean-going ships – a suitably funded R&D programme needs to commence more or less immediately under the supervision of the Organization.

103 A coordinated R&D programme and collaborative effort of the necessary scale can only be funded by the industry within a mandatory IMO framework, if the required funding is to be generated and to ensure that shipping companies worldwide will contribute on a fair and equal basis. The R&D programmes required to ensure delivery of the Initial IMO Strategy can only be created and succeed within the IMO framework. Establishing the IMRB and the $2 R&D contribution outside of the IMO regulatory framework could only be voluntary, and the diversity and number of shipowners and customers (who in many trades often pay for the cost of fuel oil) would make a voluntary programme infeasible and unable to generate the funds needed to support R&D programmes of the scale required.

104 Under a non-mandatory mechanism outside of IMO there would be no mechanism to report and verify the necessary data for implementation of funding and enforcement of R&D contributions, and the "free-rider" problem would make participation competitively unattractive even for otherwise willing participants.

105 Implementing the IMRB proposal through the IMO regulatory framework would demonstrate to the world that IMO has put in place a comprehensive and realistic R&D programme to assist in achieving the levels of ambition in the Initial IMO Strategy.

106 The underlying purpose of the proposal is to ensure, through the acceleration of R&D of low and zero-carbon technologies suitable for maritime application, that the world economy, including the economies of LDCs and SIDS, will continue to have access to efficient and low cost maritime transport, notwithstanding the requirement of international shipping to meet the ambitious GHG reduction targets set by the Initial IMO Strategy.

107 Any impacts on States arising from this proposal also need to be considered against the substantial benefit that the IMRB proposal will provide by a collaborative pooling of resources, to be paid for by ships registered with all Member States. This would generate a scale of funding for R&D for the decarbonisation of maritime transport that most individual countries, especially LDCs and SIDS, would be unable to provide working on their own.

Appendix

Clarksons Research Disclaimer

The material and the information (including, without limitation, any future rates and/or forward looking predictions) contained herein (together, the "Information") are provided by Clarkson Research Services Limited ("Clarksons Research") for general guidance and not by way of recommendation.

The Information is provided on "as is" and "as available" basis. Clarksons Research and all its Group companies make no representations or warranties of any kind, express or implied about the completeness, accuracy, reliability, suitability or availability with respect to the Information. Any reliance placed on such Information is therefore strictly at the recipient's own risk and no responsibility is accepted for any loss or damage howsoever arising. Please note that future rates and/or forward looking predictions are for illustration purposes only and given without guarantee; the ultimate outcome may be different.

This Information is not for reproduction or distribution without Clarksons Research's prior written consent. Especially, the Information is not to be used in any document for the purposes of raising finance whether by way of debt or equity. All intellectual property rights are fully reserved by Clarksons Research, its Group companies and/or its licensors.

This disclaimer shall be governed by and construed in accordance with English law.

CLARKSON RESEARCH SERVICES LTD, COMMODITY QUAY, ST KATHARINE DOCKS, LONDON, UNITED KINGDOM, E1W 1BF

___