

International Workshop on Greenhouse Gas Emissions and Shipping

13–14 November 2018
Singapore

Workshop Report

Co-organised by

CIL
CENTRE FOR INTERNATIONAL LAW
National University of Singapore



The Centre for International Law (CIL) at the National University of Singapore hosted a two-day workshop on greenhouse gas (GHG) emissions and shipping on 13-14 November 2018. The workshop was co-organised with the Maritime and Port Authority of Singapore (MPA). The objective of the workshop was to bring together legal and industry experts to discuss the Initial Strategy on reduction of GHG emissions from ships adopted by the Marine Environment Protection Committee (MEPC) of the International Maritime Organization (IMO) in April 2018. The workshop aimed to explore GHG reduction from legal, technical and industry points of view, while outlining the technical background and major issues in the reduction of GHG emissions. Academic speakers were invited, as well as speakers involved in the development of the strategy at the IMO, the MPA, and from the bunkering and ship and engine manufacturing industries. Ship owners, classification societies and environmental groups were also represented.

Workshop opening

1. After a short welcome and introduction by **Associate Professor Robert Beckman**, head of the Oceans Law and Policy programme at CIL, the workshop was opened with an address by **Mr Andrew Tan**, Chief Executive of the Singapore MPA. Mr Tan outlined the importance of international shipping for development, its importance in free trade today and going forward, and how the IMO Initial Strategy will impact this industry. He discussed Singapore's particular interest in shipping and the work of the IMO, including in fostering a continuing wider consensus on the IMO Initial Strategy. Mr Tan highlighted the role that the discussions at the workshop could play in contributing to the achievement of this continuing wider consensus, and also mentioned other previous MPA events that have similarly contributed to this goal. He then welcomed the wide variety of industry and academic speakers, and participants from the region and beyond.

Panel 1 – Background and Legal Framework

2. The first panel covered the background and legal framework regarding GHGs. **Captain J Ashley Roach** of CIL opened the panel with an introduction to the history of GHG regulation at the IMO. Captain Roach began with a discussion of early instruments addressing air emissions more generally, beginning with the 1982 United Nations Convention on the Law of the Sea (UNCLOS), highlighting Arts 212 (pollution from or through the atmosphere), 222 (enforcement with respect to pollution from or through the atmosphere), and 1.1(4) (definition of "pollution of the marine environment"). Other instruments mentioned included 1985 Vienna Convention for the Protection of the Ozone Layer, 1987 Montreal Protocol on Substances that Deplete the Ozone Layer, and Agenda 21 (including its recognition of need that IMO take action). He then outlined the evolution and scope of Annex VI to the International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 (MARPOL) and its breadth (in terms of substances addressed and ratification) and its importance. He described the 15 amendments to Annex VI, highlighting especially those in 2011 (New Chapter IV, Regulations on Energy Efficiency for Ships), 2016 (Data Collection System for Fuel Consumption of Ships) and 2018 (EEDI for Ro-Ro Cargo Ships and Passenger Ships).

3. Captain Roach then outlined how air emissions were dealt with at the IMO, first as a single agenda item at the MEPC and then split into 3 agenda items (Air pollution and energy

efficiency, Further technical and operational measures for enhancing the energy efficiency of international shipping (added in 2013 by MEPC 66), and Reduction of GHG emissions from ships).

4. Captain Roach then introduced the package of technical and operational measures to improve energy efficiency and reduce GHG emissions from shipping (Energy Efficiency Design Index for new ships (EEDI), Ship Energy Efficiency Management Plan (SEEMP) and Energy Efficiency Operational Indicator (EEOI)), adopted as amendments to MARPOL Annex VI in 2011. He then gave detail on the EEDI and SEEMP becoming mandatory in 2013, being the first legally binding climate change treaty adopted since the Kyoto Protocol, and the data collection system on fuel consumption adopted in 2016. He then described the 2012 non-mandatory guidelines to aid implementation of the mandatory rules. He went on to describe the recent work of the MEPC regarding the Strategy at MEPC 73.

5. Next, Captain Roach then briefly described the relationship between the United Nations Framework Convention on Climate Change (UNFCCC) and GHGs, including relevant provisions, the objective of the UNFCCC, the Kyoto Protocol and that the Paris Agreement does not directly address GHGs from shipping due to the role of the IMO as the regulatory body for the industry.

Captain Roach's slides are available at: <https://cil.nus.edu.sg/wp-content/uploads/2018/11/Session-1-Ashley-Roach.pdf>.

6. **Professor Aldo Chircop**, Canada Research Chair in Maritime Law and Policy, Schulich School of Law, Dalhousie University, gave the second presentation on Panel 1, on the 'Current state of play at the IMO regarding strategy on GHGs.' He began with a more detailed explanation of the IMO Strategy. He described the Roadmap for Developing a Comprehensive IMO Strategy on Reduction of GHG Emissions from Ships adopted at MEPC 70 and the series of sequential steps to 2023, which will lead to the adoption of the revised IMO Strategy. The Initial Strategy structure was outlined, and particular challenges (levelling the playing field, states without capacity to implement strategy) were mentioned.

7. Prof Chircop highlighted the challenges of basing the Strategy on data from four years ago, and that this should be addressed in any future emanation of the Strategy. He also made further reference to the relationship of the Intergovernmental Panel on Climate Change (IPCC) and the IMO on GHG emissions and why the IMO, as the competent international organisation, is best placed to address this issue. He outlined the rationale for setting revisable targets, in order to be able to take into account current knowledge. He described the levels of ambition of the Initial Strategy, including the carbon intensity target and emissions reduction target. The guiding principles underpinning the achievement of the targets were laid out: non-discrimination, no more favourable treatment, common but differentiated responsibilities and respective capacities (CBDR-RC), full and complete effect by all ships regardless of flag, consideration of impacts of measures on states including developing countries, least developed countries (LDCs) and small island developing states (SIDS), and evidence-based decision making. He then laid out the timeline for short term measures 2018-2023, and the possible measures e.g. improvement of the EEDI, national action plans, technical cooperation/capacity building, research and development (R&D), among others. There was then a brief overview of the timelines for medium term (2023-2030) and long term (2030-

2050) measures and the potential measures for each. The differing impacts of the Initial Strategy and its implementation for various states were highlighted. In addition, barriers and supportive measures were laid out, particularly the special capacity building needs of developing states and the IMO's need for support from members (financially).

8. The need for various measures for implementation of the Initial Strategy was raised, including in terms of technical, operational, technology transfer, market based measures (MBMs) and other measures. MARPOL was highlighted as the appropriate instrument for some elements, but not, for example, for MBMs. Codes, guidelines and recommendations were also highlighted as possible instruments. The various actors engaged were highlighted (IMO: MEPC, Marine Safety Committee (MSC), Legal Committee (LEG), Facilitation Committee (FAL), and Technical Cooperation Committee (TCC), International Association of Classification Societies (IACS), the International Organization for Standardization Technical Committee 8 (ISO TC 8), and port state control memoranda of understanding). The issues of review, monitoring and compliance mechanisms through the IMO, the Conference of the Parties to the UNFCCC in Paris, Subsidiary Body for Scientific and Technological Advice (SBSTA) and regional mechanisms were raised, and the importance of continuous engagement at the IMO was highlighted. Follow up actions, short and long term planning and review of impacts on states, as well as the classification of short term measures into groups A (considered/addressed under existing IMO instruments), B (not work in progress/subject to data analysis), and C (not work in progress/not subject to data analysis) were then laid out. Prof Chircop suggested possible short term measures for groups A, B and C, including those defined as actually helping to reduce emissions by 2023 and in terms of mandatory and voluntary measures. The issue of who will assess the impact of each measure was raised – with the suggestion that an independent expert panel might be the most appropriate.

9. He then made the point that 'the devil is in the detail', in that theoretical solutions face issues in practice: For example, although speed reduction can reduce emissions significantly, slow speeds are not necessarily optimal, and practical obstacles to it as a solution include safety and maintenance concerns, modal shifts to, for example, road transport, prolonged voyage (perishable goods), energy efficient ships penalised, spread of exotic species and difficulty of enforcement.

10. Prof Chircop then raised the issue of port-ship interface. He raised the issue of ports contributing to GHG reductions in various ways, though he underlined that these actions are not under the remit of the IMO as these are captured as national emissions and not emissions from international shipping.

11. Prof Chircop concluded by highlighting the 2018 IPCC report and that the IMO's Initial Strategy does not respond adequately to the urgency of the climate change issue, miscalculation of how oceans can absorb carbon, the tension between the evidence-based approach and the precautionary approach, prescriptive vs goal based approaches, the impact of the sulphur rule on the IMO strategy, the need to start planning for MBMs, the weighing of impacts, costs and the costs of not acting early enough, and a compensatory mechanism for SIDS.

Prof Chircop's slides are available at: <https://cil.nus.edu.sg/wp-content/uploads/2018/11/Session-2-Aldo-Chircop.pdf>.

12. **Mr Hanqiang Tan**, Manager (International), MPA, then made comments on developments at the MEPC. He noted that the initial Strategy incorporates existing measures and measures or actions that were previously agreed upon, and builds upon them to deliver a coherent strategy that also sets out “stretch” targets. He commented that the Initial Strategy was more than its quantitative targets, which tended to dominate the headlines, and needs to be viewed in its entirety: it is a comprehensive package, i.e. literally a strategy – for the IMO’s work on the reduction of GHG emissions from international shipping. He added that the Initial Strategy was a result of long and intense negotiations, and reflected hard compromises by everyone. There was consequently almost full consensus over its adoption. He also commented that the IMO successfully delivered the Strategy while under strong internal and external pressures. The UNFCCC had agreed to the Paris Agreement at the end of 2015, and the ICAO had established its Carbon Offsetting and Reduction Scheme for International Aviation (CORSI) in 2016 .

13. He highlighted that the outcome of MEPC 73 – i.e. the programme of follow up actions - is aimed at helping IMO member states reach the targets in the Initial Strategy; it does not replace the Initial Strategy. He noted that, looking to the next MEPC meeting (74), proposals on concrete measures and a preliminary assessment of their impact on states will be the focus.

14. He added that there was and will continue to be push and pull on measures to be taken. The differing views and resulting friction comes in many aspects such as time, the impacts on states and capacity building and technical cooperation. In terms of time, states have differing views about effectiveness of measures to actually reduce GHGs, what the future will hold in terms of available fuels, and what kind of capacity building is required (not after the fact but at an early stage and also ongoing). In terms of impacts on states, he noted that creating a common framework to evaluate the impacts on states would be useful. However, he acknowledged that it was a multifaceted issue, and the challenge was for member states to stick to the agreed upon timelines to deliver results. In terms of capacity building and technical cooperation, he noted that some states may require help from the very start to undertake impact assessments. He raised the importance of inclusivity of meetings – e.g. for SIDS and LDCs to be included into discussions at the IMO.

15. **During the discussion** session many important points were raised. The controversial nature of MBMs in the previous IMO sessions was highlighted and the suggestion was made that MBMs might perhaps be left to one side first to avoid the long debate and political controversy. Indeed, the real possibility of MBMs to incentivise emission reduction was questioned, given that a commercially viable low carbon fuel is not available for the shipping industry yet. In this regard, an MBM may simply raise the price of carbon at this stage. However, it was also pointed out that funds raised through MBMs could be used for R&D or helping to level the playing field. It would be a channelling of funds to address issues of GHGs, such as looking into ways to achieve zero carbon fuels. It was pointed out that the role of WTO rules has not been appropriately dealt with in the context of MBMs on GHG emissions from shipping, and this is an issue that ought to be addressed.

16. There was also emphasis on the ambitious nature of the targets, which should not be ignored. It was also pointed out that while the IMO strategy is ambitious, it is not in line with the 1.5°C Paris Agreement target. At the same time, the point that shipping is only a minor contributor to GHG emissions and may not itself actually be able to contribute significantly to

the 1.5°C target, was raised. It was suggested we may need to be much more ambitious, although the difficulty of aiming at moving goalposts was underlined. The need for balance of development and environmental protection was highlighted.

17. The point was also raised that the role of trade in globalisation and environmental degradation, especially its contribution to climate change, needs to be recognised.

18. It was suggested that restrictions could apply to new ships but the difficulty of transitioning older vessels should be taken into account. It was then pointed out that this could create an uneven playing field and trade distortions. The point was also raised that this would impact the ability to meet the targets, as many older ships would continue to emit GHGs into the period 2030.

19. The alternative fuel question was raised, including the difficulty in proposing measures where there is so much uncertainty, and that this may be a bad investment possibility. It was pointed out that the Strategy should not be seen as a fixed plan but rather a rolling strategy with a clear goal that can adapt to the required ongoing knowledge building process. It was outlined that the sulphur rule had pushed part of industry to use LNG, which was better and produces less CO₂ but is still a carbon-based fuel. It was suggested that industry may have to make decisions on priorities going forward without firm guidance. A delegate pointed out that the ballast water example should teach us not to put the cart before the horse in terms of regulating without the necessary technology. It was suggested that fuel choice may become more regionalised or related to the route.

The issue of speed reduction having the potential for serious market distortions was raised. While some participants felt that speed optimisation was a viable alternative to speed reduction, others felt that the issue should be more carefully considered.²⁰ It was highlighted that the UNCLOS provides an obligation not to transform pollution into another type of pollution, and the issue of noise pollution was raised. It was further suggested that the IMO guidelines do not appear to be effective in influencing ship design and noise pollution should be borne in mind in the development of future reduced or zero emission ship design.

21. Further issues were touched upon in the debate, including the effects on SIDS and LDCs, the ongoing negotiations on a new instrument under UNCLOS covering marine biodiversity in areas beyond national jurisdiction (BBNJ) influencing funding mechanisms at the IMO, and an adaptation fund.

Panel 2 – IMO Strategy in Practice

22. The second panel was opened by **Mr Sveinung Oftedal**, of the Norwegian Ministry of Climate and Environment and Chair of IMO MEPC Working Group on Reduction of GHG Emissions from Ships. He presented on reconciling different views and interests within the IMO process, with the key question being at what time is it more important to solve the challenge than preventing negative consequences to the existing economy.

23. On the regulatory framework for shipping, Mr Oftedal described the various environmental challenges of shipping, addressed through flag state obligations, port state

rights and mandatory audits of members. He mentioned the role of the IMO in the global system and its role in providing global solutions. He also made reference to regional frameworks supplementing the global frameworks, and local requirements on the state or port level.

24. Next, Mr Oftedal emphasised new challenges in today's world – technology and transparency requirements, and changing society (challenges that the IMO meets). He also underlined that many different perspectives exist, also at the IMO itself, particularly the duelling opinions that shipping is a soft and/or the last target. He pointed out that climate change is global change: The two are intrinsically linked and so are solutions.

25. Mr Oftedal outlined the important achievements of the IMO on climate change. He began with the 1997 IMO mandate established through MARPOL, the 2003 Resolution A.963(23) "IMO Policies and Practices related to the Reduction of Greenhouse Gas Emissions from Ships", the 2004 Norway proposal for emission target for international shipping, the 2011 energy efficiency amendment to MARPOL Annex VI and its 2013 entry into force, the 2015 proposal by Tony de Brum of the Marshall Islands on a target for shipping consistent with keeping emissions below 1.5°C, the 2016 Roadmap, the 2018 MARPOL Annex VI amendments on data collection system and the adoption of the IMO Strategy in April at MEPC 72.

26. In more detail, he explained the preparations for developing a plan and creating the Roadmap, as well as the challenge faced at MEPC 68 in 2015. Mr Oftedal addressed the problem of how to achieve the impossible: an emissions target in line with the 1.5°C temperature target. He highlighted the importance of the need to create links to all groups at the IMO but, at the same time, having no association with any particular group/interest. He explained how this led to the finalisation of the data collection system. He addressed the challenge faced at MEPC 69 in 2016 of ensuring an adequate allocation of time to consider the emissions target issue. He stated that this was addressed by avoiding polarisation and using knowledge on method of work. A working group was established at MEPC 70. Mr Oftedal reported that the challenge at MEPC 70 was to ensure that all key players were on board, which was achieved through submitting the proposal co-sponsored by US. MEPC 70 approved the Roadmap for developing a comprehensive IMO Strategy on reduction of GHG emissions from Ships, which stated that discussions should include levels of ambition and guiding principles for the Strategy.

27. He then outlined key challenges in his work: vision, levels of vision, guiding principles. He discussed meaningless vs meaningful strategy, high ambition vs no ambition, efficiency only vs efficiency for ship /sector, numbers vs no numbers, and differentiation of principles and the effect that such misalignments had on negotiations.

28. Mr Oftedal made mention of the importance of planning and laying the groundwork for the development of the Initial Strategy, describing the scale of the risk and that this work cannot afford to fail. He emphasised that all must be on board with the solution. He highlighted that developed and developing countries must accept the solution or it would be a failure. He stated that this requires a plan for the total process: The key action was to build trust, take an active lead, avoid dead ends, develop a product not a problem, and avoid square brackets. He then described the final outcome: success in clear text, which was finally agreed with massive support.

29. Mr Oftedal then very briefly mentioned follow up actions required in short, medium and long term, especially with focus on fuel. The three 3 pillar action included national spearhead policies, development and implementation of the IMO legal framework and technical cooperation.

Mr Oftedal's slides are available at: <https://cil.nus.edu.sg/wp-content/uploads/2018/11/Session-1-Sveinung-Oftedal.pdf>.

30. The second speaker on the panel was **Associate Professor Jasmine Lam** of the Maritime Energy and Sustainable Development Centre of Excellence, Nanyang Technological University, Singapore. She presented on the technical background and major issues: engineering operations, alternative fuels. She began by describing the work of her research centre and how it is relevant to this topic. She then described technical and operational measures, including measures for GHG emission reduction. She stated that, largely speaking, the reduction potential for technical and operational measures is small – up to 10%. Alternative fuels have the highest reduction potential (up to 100%), although slow steaming is also significant (50%).

31. Prof Lam discussed the prospects for fossil-based fuels, LNG, methanol and hydrogen, and non-fossil based fuels: biofuels and renewable hydrogen. She then examined the technology readiness level (TRL) for 2030 (some scoring highly, and retrofitting possibilities), and 2050, where most will achieve full readiness. The cost of measures was also highlighted.

32. She provided graphs showing that technology and operational measures alone are not sufficient to meet IMO targets – they would reduce business as usual emissions but not meet IMO targets. The model showed large gaps of 250 million metric tons to 2030, and 835.5 million metric tons to 2050. She therefore concluded that alternative fuels are necessary.

33. Prof Lam highlighted that it must be recognised that energy demand for ships will increase significantly (around 25 times the output of all 99 US nuclear power plants). Her Centre is doing research on both fossil and non-fossil fuels. She underlined the importance of analysing supply chain perspectives. Emissions and on-board performance is not enough; energy generation, transport and application must also be analysed. In doing so, her research demonstrated that many alternative fuels are mature for consumption. She discussed some of these fuels, such as biofuels, renewable H₂, as examples, and demonstrated the potential of them through life cycle analysis – especially biodiesel from algae.

34. Prof Lam then described the importance of various criteria for selection towards sustainability, broadly categorised into the categories of social, technological, environmental and economic sustainability. These criteria include capital costs, bunkering price, costs of infrastructure, social acceptability and safety, maturity and reliability of energy source, and reduction of GHGs. She argued that considering all of them is the only way to ensure a solution is sustainable.

35. With regard to carbon emission accounting, Prof Lam highlighted that data collection is important regarding emission levels, inventories etc. She provided a model on container ship trajectories (that can be scaled up for regional and international estimates) – estimating emission levels, providing different types of ship emission analysis, and developing simulation models. She informed the workshop that NTU has developed an emission calculator.

36. Regarding the way forward, Prof Lam emphasised that purely technical and operational measures will not meet targets, and, although optimising vessel speed has importance, alternative fuels are the way forward, with holistic analysis for sustainability being key and carbon emission accounting being of importance.

Prof Lam's slides are available at: <https://cil.nus.edu.sg/wp-content/uploads/2018/11/Session-2-Jasmine-Lam.pdf>.

37. The third speaker was **Associate Professor Kah-Hin Chai**, of the Department of Industrial Systems Engineering and Management at NUS, discussing a systems perspective to MBM comparison. He began by noting that there are different MBMs and the 'devil is in the detail'. He then discussed what MBMs are: carbon taxes (such as a bunker levy) and emissions trading schemes (ETS).

38. He noted that they have been discussed heavily at the IMO over the years, including the International GHG Fund (MEPC 60/4/8), Leveraged Incentive Scheme (MEPC 60/4/37), Port State Levy (MEPC 60/4/40) and Global Emission Trading System (MEPC 60/4/22, MEPC 60/4/26, MEPC 60/4/41, MEPC 60/4/54). He pointed out that carbon tax is not strictly market based. He then discussed their history – carbon taxes and ETSs have been used globally. He gave the Singapore carbon tax as an example. He pointed out that in different regions carbon has been priced differently, for example in Scandinavia it has been priced highly, whereas in Mexico and Japan the carbon prices have been lower.

39. Prof Chai then went on to address how MBMs actually reduce CO₂: through greener technology or a change of behaviour. He highlighted that R&D can be financed through a carbon tax, or can lead to emission reductions to avoid the carbon tax. He noted that an ETS pre-specifies a cap and forces stakeholders to adopt greener technology or change behaviour to stay within limits. He then considered carbon tax vs ETS: He postulated that they are probably equally good or equally bad. However, he pointed out that the specific context of international shipping must be assessed. He underlined that to meet the 2050 goal, assumptions about technology have been made. He then questioned whether the technological changes required to meet 2050 targets are feasible. His analysis showed that historically the time required for such change would be at least 50 years. He determined that at the current rate of adoption, we will not meet the 2050 target, but with a push to increase the adoption curve in 2020, it is optimistically possible to have a slim chance to meet the 2050 target.

40. He then demonstrated how he established the four criteria for comparison of MBMs: effectiveness in generating funds, effectiveness in investing in R&D, effectiveness in encouraging adoption of technology with a high technology readiness level, and certainty of emission reduction. The other relevant factors included cost effectiveness, ease of implementation, evasion and carbon leakage avoidance and recognition of early actions.

41. Prof Chai went on to describe the challenges in operationalising the benefits of MBMs for both a bunker levy or an ETS. He stated that MBMs could serve as a method to reconcile the principles of No More Favourable Treatment (NMFT) and CBDR-RC, when the collection of bunker levy or implementation of ETS apply equally on all ships, but a portion of the revenue from the MBM are used to rebate certain countries according to guidelines (and the rest of the funds from the MBM to remain in the industry for R&D).

42. Prof Chai concluded that overall a bunker levy is more favourable – although an ETS provides the only probability of absolute CO₂ reduction. He also outlined the cost of fighting climate change – stating that a war chest is required. He finally concluded that MBMs should be adopted now and not in the medium term, with the bunker levy being most favourable, all things considered. This is because MBMs do not reduce CO₂ emissions on their own; the actual reduction comes from R&D and technological adoption, which take a long time.

Prof Chai's slides are available at: <https://cil.nus.edu.sg/wp-content/uploads/2018/11/Session-3-Chai-Kah-Hin.pdf>.

43. In the **discussion**, it was first highlighted that the recommendations from the last 2 panellists would require political will, which may not be forthcoming.

44. There was comment on the 2030 target, highlighting that it is an efficiency target, not an absolute target; and that it is a stretch but can be achieved. The 2050 target requires innovation and zero emission fuels. Prof Lam responded that she understood this point but that her estimations and analysis are still helpful in moving forward. It was pointed out that the panellists' analysis was based on 50% reduction, but actually the wording is at least 50% and modelling should reflect that.

45. It was commented that time left is short and efforts cannot fail, in order not to fail it is important to build upon what is possible in the near future where there are legal instruments in force and consensus on how to move forward. We must agree on what we can agree upon – global agreement is required.

46. Commenting on MBMs, it was noted that language is important, as using the word tax or levy would almost instantly negate political will. Prof Chai agreed but stated it is also important to show how money will be used to prevent such reluctance and to ensure transparency. It was raised that there is an ETS model that does not provide absolute limits but rather staged costs if it goes above limits. It was also suggested that it is possible to have an ETS not limited to shipping and trading could move emissions reductions to sectors where the technology does exist – this may be addressed at the IMO. In response, it was stated that such an approach may mean in 20 years shipping has not reduced its emissions at all. It was highlighted that it is not the levy that will reduce emissions but the investment in R&D from the levy.

47. With regard to the UNFCCC and IMO, it was questioned whether there was really pressure to take the issue of GHG emissions from shipping away from the IMO, which was answered in the negative.

Panel 3 – Non-Government Stakeholder Perspectives (1)

48. The third panel on Non-Government Stakeholder Perspectives began with a presentation from **Mr Simon Neo** from the International Bunker Industry Association on implications for the bunkering industry. Mr Neo described the work of the International Bunker Industry Association and its role at the IMO, in standardisation and membership, partnerships with

industry stakeholders including with the IMO, governments, NGOs, and industry, among others.

49. He addressed the challenges in the bunkering industry approaching 2020 regarding sulphur: operational challenges, availability of compliant fuel in smaller ports, specifications of compliant fuel, prices of compliance and alternative fuels. He discussed how to effectively operationalise and cut operational costs. He emphasised the issue of price stability on choices for ship owners. The uncertainty of low sulphur fuel or other alternative fuel sources provides further uncertainty. He highlighted the problem of compliance and how port states can ensure compliance.

50. Regarding options and considerations for vessels taking bunkers, Mr Neo discussed compliant oil-based fuels, LNG or other low flash point fuels, technology solutions: scrubbers, but questioned if there are others. He emphasised that ship owners will look at price differentials, time spent in ECAs, investment and operational costs and complexity, fuel availability and technology reliability.

51. Mr Neo then discussed the practical issues facing the bunker industry and availability of compliant fuels – outlining that many questions remain – including whether 2020 will be postponed. He reported that this is a question still asked by ship owners, even if it is not possible. There are questions relating to availability of compliant fuel, its quality, whether to use straight run or blended, what specifications, when the ISO will provide a standard, what about contaminations, specifications for LNG, ethanol, LPG etc. He described uncertainty about global availability of low sulphur fuel and how some regions are more prepared than others. He underlined that major ports do not have an issue but smaller and developing country ports may not have compliant fuel. He reported that heavy crude from some Middle Eastern countries contains more sulphur than other fuel and it is an issue how much it costs to refine this fuel to be compliant. Specifications are slow in coming and will not provide all the details required for ship owners to make informed decisions.

52. Mr Neo also included information about the CE Delft Study forecast and discussed whether the numbers stack up regarding scrubbers and what the carriage ban implications are.

53. He then outlined the challenges for smaller ports or countries where there is little bunkering infrastructure, bunkering is not the main business, or it is out of the normal trading route. He also outlined further difficult issues about non-availability of compliant fuel. He described the IBIA efforts at the IMO to reduce sulphur disputes and the problems with testing. He then gave an overview of the IMO best practice guidance.

Mr Neo's slides are available at: <https://cil.nus.edu.sg/wp-content/uploads/2018/11/Session-1-Simon-Neo.pdf>.

54. The second presentation in this panel was given by **Mr Sanjay Verma** from Wärtsilä Singapore on the implications of the IMO Strategy for engine and ship manufacturers. He began by giving some information on the work of Wärtsilä as an engine builder and its efforts to strive for emission reduction.

55. He described the two types of emissions from engines, local, health and environment related, and GHGs, which are climate related. He described how emissions are formed in fuel

combustion. He described how gas engines compare favourably to diesel engines, even in the worst case of methane slip. He went on to demonstrate that there are many options that exist to reduce GHG emissions, including fuel de-carbonisation and lowering non-CO₂ emissions (prime example is CH₄ emitted from gas engines).

56. Mr Verma predicted that there will be technological innovations that will replace fuel as the energy source for shipping. He underlined the importance of ship design, asset management, voyage management as well as the engine itself in order to optimise energy use. He also emphasised the role of ports and automated information exchange in the shipping ecosystem and how they all contribute to emissions or emissions reduction. For instance, having more efficient ports could reduce the waiting time of vessels at ports, which would help to reduce GHG emissions.

57. He emphasised that we should not equate fuel and energy and then outlined the future potential of hybrid energy sources and combining wind, solar, wave, and other fuel sources to realise low emission shipping. He gave examples of a hybrid wind power assisted ship currently in use and stated his belief that this will be the way that older ships can be upgraded to lower emissions.

58. Mr Verma then demonstrated the decreasing price of battery packs and increasing battery energy density and described how this will enable battery powered shipping to become a reality in the foreseeable future. He pointed out that R&D does not have to be specifically in the marine sector but may contribute to low emissions shipping developments.

59. Mr Verma then provided a case study regarding the new Shuttle Spirit tanker that will use fuel gas mixing with LVOC and LNG, which will charge a battery when burned and supplement the battery when required. He also gave other examples of ships currently in operation using new technologies that show that another way is possible.

60. He mentioned the need for a combination of efforts that is required to reach goals, including optimised voyage, vessel energy need, power distribution, and efficient energy generation. But he stated that it is possible.

61. He pointed out that it is not constructive to wait for alternative fuels when there exists technology already that can substantially reduce GHG emissions. He then demonstrated a vision of the ships of tomorrow, with hybrid energy systems, solar and wind power, optimised hulls and electric propulsion.

Mr Verma's slides are available at: <https://cil.nus.edu.sg/wp-content/uploads/2018/11/Session-2-Sanjay-Verma.pdf>.

62. In the **discussion**, questions were raised relating to whether engine and ship manufacturers such as Wärtsilä are providing for ships that need to be adapted to meet requirements. This was confirmed, although LNG only with newer engines.

63. It was pointed out that ship owners are expecting bunkering prices to go up: They are trying to make ships as efficient as possible, but ship owners have many regulations that they have to adhere to (e.g. sulphur, biofouling, ballast water management) and academics must look at measuring the efficiency of ships in totality. It was clarified that there are available

solutions in the market by Wärtsilä that would help shipowners evaluate the efficiency of their ships.

64. It was questioned whether there currently exists performance monitoring that is acceptable to all stakeholders? It was confirmed that there are companies providing this.

65. On fuel oil quality, it was highlighted that parameters important for safety, health and environment had been proposed at the IMO but had failed to receive enough support. A question was posed on whether fuel supplier and engine manufacturers are interested in having a better fuel specification in a regulatory approach, particularly specifications that are important to safety, health and the environment. It was pointed out that all suppliers have to declare, for the purpose of the bunker delivery note, that their fuel complies with MARPOL Annex VI, Regulation 18. However, it was stated that disagreements between buyer and seller on their contractual obligations result in disputes over quality.

66. One delegate questioned what regulatory mechanisms would provide incentives for optimisation in the way discussed. A reply was that incentives alone were not enough, and that disincentives were required as well. There are energy efficient technologies today that can be applied.

67. Finally, the point was raised as to why the focus on sulphur and not CO₂ in terms of implications for the bunkering industry. It was then highlighted that although CO₂ will have more impact on the bunkering industry in the long term, only one issue at a time can be addressed and first things first is sulphur.

Panel 4 – Non-Government Stakeholder Perspectives (2)

68. The fourth panel, continuing on the theme of non-government stakeholder perspectives, began with a presentation from **Mr Simon Bennett**, International Chamber of Shipping, on the implications of the IMO strategy for ship owners.

69. He reported that industry is looking at both short and long term measures. He put forward that the industry, represented by ICS, is completely committed to implementation of the IMO strategy. He mentioned that the Strategy has established ambitious targets, and to achieve these ICS is considering a number of measures, including new innovative emission reduction measures. He made reference to <http://www.ics-shipping.org/docs/default-source/resources/reducing-co2-emissions-to-zero-the-paris-agreement-for-shipping.pdf?sfvrsn=7>.

70. The second speaker on this panel was **Ms Aoife O'Leary**, from the Environmental Defense Fund, giving an environmental perspective for the shipping industry.

71. Ms O'Leary began with the IPCC report and demonstrated that it should be used to frame our current debate, especially the focus on pathways limiting global warming to 1.5°C. She highlighted that shipping emissions are significant and must not to be downplayed, while at the same time emphasising that the importance of shipping is not being undermined and is central for international growth and development.

72. She then discussed the IMO target, and how a 50% reduction by 2050 is not in line with the 1.5°C Paris Agreement target and the need for review of the target in 2023, which requires a substantial amount of zero emission vessels. She mentioned that a solution-based approach to discussions should be incorporated into the debate at the IMO, rather than purely focussing on the negative impacts, as reframing to look at the positives may yield better results.

73. She then highlighted the potential for renewable fuel provision globally to demonstrate how the possibility does exist in the long term to move to renewable energy sources, especially in developing countries. She underlined the necessity of investing money into alternative energies, especially to help build the capacities of developing countries in renewable energies.

74. Ms O’Leary then touched on the IMO strategy with regard to mid/long term measures and submissions in MEPC 74 in 2019: She highlighted the need to establish a series of intersessional GHG meetings to 2023, and the need for carbon pricing, demonstration projects and fuel supply chains for developing countries supported through IMO fund. She emphasised the need to ensure developing countries do not view this as a burden but an opportunity. She pointed out that opportunity exists in the movement to low or no emission shipping, but it must be ensured that it is available for all states.

75. Ms O’Leary also made reference to her paper on ‘The Legal Bases for IMO Climate Measures’, published earlier this year, which engages more fully with the legal issues involved (link available in slides).

Ms O’Leary’s slides are available at: <https://cil.nus.edu.sg/wp-content/uploads/2018/11/Session-2-Aoife-OLeary.pdf>.

76. The final presentation of this panel was given by **Mr Denzal Hargreaves**, of DNV GL-Maritime, on the perspective of classification societies. He began by elaborating on why classification societies are engaged in GHG emissions reductions. He noted that DNV GL has recently published a series on the forecast to 2050, with the maritime forecast being the basis of his presentation.

77. He emphasised the forecast of a 100% increase in seaborne trade by 2050 and how that may impact the emissions reductions discussed. The problems of aging ships meeting standards and the economic and environmental drivers engaged in the meeting of targets were highlighted.

78. Mr Hargreaves laid out how the forecast provides outlooks for key drivers – regulations, technologies and fuels and goods to be transported. He described the surge in environmental regulation of shipping in the last decade, which was brought about by need and did not occur pre-emptively. He pointed out that willingness to adopt has been slow (with the example of the Ballast Water Management Convention), while reluctance to adopt has also been seen with sulphur regulations). He emphasised the conclusions of Prof Lam on alternative fuel sources and stated that it is difficult to identify the ‘winners and losers’.

79. Mr Hargreaves then pointed to the impact of the 2020 sulphur limit in terms of switch volumes. He questioned whether such a dramatic shift will be possible in such short time. He highlighted that there are issues regarding what should be done in theory vs the actual

availability and what effect this will have on the geographical supply. He then showed that there was a low but increasing demand projected for green bunkering.

80. Mr Hargreaves made reference to the issue of competitiveness and CO₂ emissions in ship design. He outlined that there are many uncertainties with the potential for big shifts. He outlined that DNV GL has developed a framework to test competitiveness in different scenarios, taking into account fuel and technology, regulations, and risk related to the market.

81. He finally described that there are a range of promising CO₂ reduction measures, including those from logistics and digitalisation, hydrodynamics, machinery and fuels and energy sourced. He concluded that solutions are possible but further clarity is required.

Mr Hargreaves's slides are available at: <https://cil.nus.edu.sg/wp-content/uploads/2018/11/Session-3-Denzal-Hargreaves.pdf>.

82. In the following **discussion**, it was suggested that the shipping industry could establish a maritime GHG emission reduction fund, which would be financed by shipping companies on the basis of tonnage (a sort of contribution system). It was posited that it would require the support of the IMO in the form of a mandatory contribution system that obliges participation, although it would be administered by industry itself and verified by flag states. The fund would aim to kick start development of the technology required to meet the 2050 IMO Strategy target. The development of zero CO₂ fuels requires a lot of commitment from research industries and requires tremendous funding, which neither individual stakeholders nor IMO member states would be able to provide. Therefore, it was proposed that the industry should take a collective responsibility to fund the development of the necessary technology. To ensure a level playing field, a new regulation could be adopted under MARPOL Annex VI which requires flag states to demonstrate that the appropriate contributions have been made, through verification with the DCS, with regular reporting to the MEPC. The fund would not strictly be an MBM or a tax, as the shipping industry would make these contributions “voluntarily”. It was noted that this is a complex proposal but could be kept as simple as possible – the MARPOL amendments could be adopted before 2023 and the system could be up and running as soon as possible.

83. It was pointed out that the fund idea was interesting but not unique, both within IMO and at the UN there are similar funds and they provide inspiration. It was emphasised that carbon pricing is politically difficult or impossible, whereas this idea would bypass this controversy and CBDR-RC issues. Another delegate opined that the fund would be able to address concerns pertaining to differentiation while reducing greenhouse gases, thereby getting a lot of countries on board. A delegate pointed out that a proposal may be detrimental to innovation – if ship owners are paying this, they will not invest in innovation themselves but rather just wait. Reference was also made to MBMs and market failure, with a delegate stating that there has to be a business case for MBMs. It was also put forward that such an arrangement may undermine efforts to create an MBM at the IMO.

84. With regard to fuel alternatives, it was pointed out that scrubbers on new build ships are problematic, although this is understandable for older ships. Scrubbers also add to energy consumption.

85. The issue was raised as to it can be brought about that developing countries will also benefit from the opportunities created.

86. It was also raised that there is an overarching challenge of reaching an optimal solution as seaborne trade grows – and it may be helpful to begin by eliminating unnecessary emissions (those not actually engaged in trade).

Panel 5 Implementation and Enforcement of the New Strategy

87. Panel 5 on Implementation and Enforcement of the New Strategy was opened by **Mr Naim Nazha**, of Transport Canada, who presented on implementation and enforcement by port states. Mr Nazha presented on Canada's air pollution regulations and port state enforcement. He made specific reference to the North American Emission Control Area (NA-ECA) and the history of emissions control at the IMO. The NA-ECA was adopted in 2012 and today has stricter standards than global standards. It is predicted to reduce emissions significantly and have major positive effects on public health and public health spending in North America. With regard to enforcement, reporting and on board testing and review are provided for. He reported that to date this has had a high 94% compliance rate.

88. Mr Nazha described the fuel oil sampling review system in place and the pre-arrival information reporting system (PAIRS). Some of the information required by PAIRS include the type and quantity of bunkers carried, including sulphur content. He pointed to the issue of non-availability of low sulphur fuel and the reporting solution in cases where low sulphur fuel was not available. After submission, Canada would either allow passage or take enforcement measures. He reported that fuel testing has shown a 94% compliance rate in Canada. Fuel non-availability reports are declining yearly, due to the continued engagement with these issues.

89. Mr Nazha then described the various possible candidate measures provided in the IMO Strategy. He described the anticipated challenges and mitigation measures with the example of speed reduction – speed changes in logbook, compliance system development or adjustment of IMO data collection, exceptions for adverse weather etc. He gave a more detailed case study on voluntary speed measure in the St Lawrence River involving a slow-down area, no-go area, caution area and recommended route. Compliance was high due to: transparent process; use of available data; tools and institutions; involvement of environmental certification program; adoption of adaptive risk management approach; and flexibility for industry to determine cost-effective and relevant mitigation measures.

90. Mr Nazha then concluded by raising the issues of the fishing fleets and how the Strategy applies to them. He noted that the issues they faced are not being addressed and invited debate on this issue.

Mr Nazha's slides are available at: <https://cil.nus.edu.sg/wp-content/uploads/2018/11/Session-1-Naim-Nazha.pdf>.

91. The second presentation was given by **Mr Goh Chung Hun**, of the Singapore MPA, on flag state best practice and incentives. Mr Goh began by discussing Singapore's efforts towards

constructive collaboration on the international stage, including between the MPA and Singapore registered ship owners and class. This involved an IMO DCS voluntary experience building phase and covered data collection and data reporting. 250 ships are involved in monthly reporting using IMO DCS format (though not reporting to the IMO). This resulted in an INF paper on lessons learned for MEPC 73 to assist others: clarification required on reporting of 'other' ship types, challenges regarding emission factors and 'other' fuels, clerical errors in recording and reporting – suggested digitisation.

92. He then outlined the MPA's green shipping incentives through the Maritime Singapore Green Initiative. He described:

- The Green Ship Programme, which applies to Singapore flagged ships
- The Green Port Programme, which applies to all ocean going ships calling at the Port of Singapore
- The Green Technology Programme, which applies to local maritime companies
- The Green Awareness Programme, which applies to maritime companies
- The Green Energy Programme, which applies to the shipping industry

93. Mr Goh then moved on to discuss best practices, which include technical and operational measures. This includes the Flettner Rotor sails, installed on a Singapore flagged ship, and the pre swirl propeller duct, installed on a new VLCC Singapore flagged ship. They also include alternative fuel, for example LNG fuelled harbour tugs. Regarding electric power source, there are battery powered inland craft. And regarding the flotsam retrieval craft, there are proposals to renew them with solar powered craft.

94. As a port, Mr Goh reported, Singapore supports LNG fuel as an interim measure before the zero emission fuel is ready. The port is preparing to be an LNG bunkering port, now in the stage of preparing for ship to ship bunkering. In addition, he reported that Singapore is driving uptake of LNG as a maritime fuel through waiver of harbour craft dues for 5 years and 10% discount on port dues if serviced by LNG fuelled harbour craft. Singapore is also building a next generation port that will include energy efficiency, water management, material and waste management, environmental planning, green building and green transport, and community and innovation in its planning processes.

Mr Goh's slides are available at: <https://cil.nus.edu.sg/wp-content/uploads/2018/11/Session-2-Goh-Chung-Hun.pdf>

95. The following **discussion** raised the issue regarding mandatory measures and enforcement obligations of flag and port states. It was noted that there is a high compliance rate in Canada and the question was raised as to what types of enforcement measures may be developed. Flag state enforcement was emphasised, and it was noted that the responsibility should not be pushed onto the port state. Reference was made to flag state enforcement, the Tokyo and Paris Memoranda on Port State Control and MARPOL Annex VI. It was stated that in the future guidelines will be issued by the Singapore MPA to Singapore flagged ships and ships calling at the Port of Singapore regarding enforcement.

96. The issue of problems with crew training was highlighted, as they may not have enough time in port to familiarise themselves with regulations. A delegate also asked what provision

had been made for teething problems going in to 2020, as the challenges need to be understood.

97. There was discussion on early movers going towards low carbon future, where owners may be encouraged to invest though incentives and perhaps lower burdens. It was asked whether it can be said that ship owners and/or manufacturers will do more to innovate if more incentives are offered. It was pointed out that there is dialogue with ship owners about compliant fuel use, monitoring but less regarding sampling. It was stated that closer cooperation would be welcomed by the MPA, which is open to ideas and funding may be available.

98. The issues of scrubbers was raised, and it was asked whether the MPA would invest in CO₂ scrubbers or are they not seen as meeting the primary goal. It was also asked what the panel's view on discharge from scrubbers is (which is discouraged, e.g., by the EU).

99. The issue of enforcement was also discussed. It was highlighted that often violations are more economic than environmental, and financial sanctions would be more appropriate than arrest, criminal law procedure is arguably not appropriate, but there is an issue of how to support port state control or impose high administration fees. It was suggested that the US might be an example, as they have an advanced system, including criminalisation. It was highlighted that Memorandums of Understanding (MOUs) are only administrative tools – enforcement still occurs under national law. It was noted that Canada is not focussing on criminalisation, and Singapore has included MARPOL Annex VI as part of its national legislation.

100. The issue of port reception facility provision for SO_x, NO_x and scrubber waste was also raised. It was stated that the ports in Canada are privatised, so this issue is not nationally regulated. However, Transport Canada is doing a review of all the ports in Canada, and port reception facilities will be one of the elements to be considered under the review. With regard to Singapore, it was stated that reception facilities will be available for residue from closed loop scrubbers. Singapore is currently looking into the need to prohibit the discharge of wash water from open loop scrubbers in Singapore port waters due to geographic circumstances and the intensity of shipping in the area. Scrub wash discharge is an offence under Canadian law.

101. LNG incentives were pointed out but the question was raised as to this bypassing hybrid and other green innovation. It was highlighted that in Singapore there are multiple platforms that cover other innovative solutions and may contribute in some way; it is not exactly co-funding but incentives exist.

Panel 6 Government Perspectives in Regional and National Contexts

102. Panel 6 on Government Perspectives in Regional and National Contexts began with a presentation on The European Union's Role in Regulating Greenhouse Gases from Shipping by **Professor Henrik Ringbom**, of the Scandinavian Institute for Maritime Law and KG Jebsen Centre for the Law of the Sea, UiT the Arctic University of Norway.

103. Prof Ringbom began by discussing the general aspects of EU regulation of GHGs from ships, including the significance of the EU and its member states in international shipping as both flag and coastal states. He described the EU decision making procedure, the EU's position on global efforts to respond to climate change and reduce GHGs, and detail on the current EU ETS. He stated that EU member states have diverse views on extending this to shipping, but it will be included in EU ETS from 2023 if the IMO does not produce results, with reference to recent Directive 2018/410 (March 2018) recital 4 and Press release 13/4 2018 – which mentions that the IMO's work is a 'significant step forward', thus indicating that it appears the EU is pleased with its work.

104. Prof Ringbom then discussed data collection systems – including the new EU system EU MRV, where data collection began in 2018 and reporting will begin in 2019 to EMSA. There will be hard sanctions for non-compliance. He then discussed the IMO DCS and the differences between the two in scope (international/national traffic, in-port emissions) and content (calculation of transport work, transparency of data, verification of data, accreditation of verifiers etc.). He then noted that the timeline will also be different, which is not significant but may create administrative issues and burdens.

105. He then laid out that the short term measures regarding EEDI and EEOI that are widely deemed insufficient and that the EU should be used more efficiently in various ways, for example strengthening reduction targets, or new operational methods based on new indicators. There is no particular proposal of the EU in this domain as it must be agreed by the IMO.

106. With regard to longer term measures (post-2023), Prof Ringbom discussed the uncertainty generally and between EU member states. There is agreement that measures are needed but there is imprecise guidance from IMO and EU at this point. He argued that if the EU decides on MBMs, this would likely be an ETS or including shipping in the current ETS, although this has not been laid out by EU, nor has what insufficiency of progress at the IMO would look like. He then laid out some fundamental issues and considerations concerning the design of a regional shipping ETS such as who is responsible for rights, what the scope should be, that rules could be circumvented, how enforcement and monitoring should take place, and effectiveness. He pointed out that it raised questions about jurisdiction ('Can you do this?' and 'how far out can the requirements extend?').

107. Prof Ringbom then went on to address the international law considerations related to this issue – including forum shopping. He gave three examples of how the matter could be approached: through law of the sea, general international law and other treaties, for example international trade law. With regard to the law of the sea he made reference to port state jurisdiction and coastal state jurisdiction, questioning whether a state or group of states can undertake such measures. Are these regional rules 'generally accepted' so that such measures would not be limited to the territorial sea? He then highlighted the argument that such a measure is not really a limit on navigation, and the issue that failure of the IMO to create rules should not limit states' ability to take action in this sphere. He discussed the reconciliation of port state jurisdiction and coastal state jurisdiction in terms of static and operational requirements, enforcement measures and the safeguards that exist. However, he also pointed out that whether UNCLOS is engaged at all is debated, and therefore it may not apply at all, as there is the issue as to whether this is really pollution or a discharge under the convention.

If not, he pointed out that general international law would be engaged and the principles on extra-territorial jurisdiction, or under international trade law and the law of the World Trade Organization. Prof Ringbom then laid out that whichever rules apply, similar balancing would have to take place in the end, and the considerations would be similar.

108. In balancing the interests involved, Prof Ringbom highlighted a series of considerations for states: effort required by ship owners/operators (financial, administrative etc.), effect on navigational rights/principle of global regulation, objective (global concern, broader implications than shipping, support in other international fora), effectiveness, available alternatives?, efforts to achieve a multilateral solution (repeated efforts), benefit for the region? (depends on usage of funds), and decisive perspective and forum for a legal dispute.

109. In his concluding observations, Prof Ringbom outlined that the EU's role at the IMO is ambiguous, but informal influence is important; and as the legality of action is questionable, IMO action is preferable.

Prof Ringbom's slides are available at: <https://cil.nus.edu.sg/wp-content/uploads/2018/11/Session-1-Henrik-Ringbom.pdf>.

110. The next presentation on the perspective from developing countries: Pacific Small Island Developing States (PSIDS) was given by **Dr Peter Nuttall**, of the Micronesian Centre for Sustainable Transport. Dr Nuttall began by mentioning that the states involved are trying to move away from the name PSIDS as it is in some ways detrimental, towards the name "large ocean states".

111. He then went to discuss what interest PSIDS have in the GHG emissions and shipping debate. He described the long standing interest by the Marshall Islands and other states, the existential threat of climate change for such states, and the particular problems in shipping in the region. He pointed out that climate financing may help address domestic deficiencies in the shipping industry. He highlighted that the existential threat includes sea level rise, increased storm intensity, increased sea temperature, decreased coral and fish, increased ocean acidification, increased plastic pollution, increased extreme heat events and increased extreme drought events. He pointed out that these states are on the front lines in climate change.

112. Dr Nuttall highlighted what the half-degree change (from 1.5°C to 2°C) means for these states specifically and emphasised the paradigm shift required. He emphasised that these states have the most to lose and the greatest need for the opportunity to improve their domestic industries. He also underlined that although increasing shipping costs will also disproportionately affect PSIDS, the positive benefits may improve their lot.

113. Dr Nuttall then outlined the choice between decarbonisation models – a carbon tax is preferable to an ETS that will shift emissions to other sectors. He argued that he supports a high tax, as even if there are negative effects for PSIDS, the high cost is better than ceasing to exist.

114. He then addressed the issue of who pays how much, to whom and when. He emphasised that the MBM debate must begin now, deflection and waiting is not an option. He highlighted the need to provide some money to help the most vulnerable countries, and underlined that

equity must be central to discussion: All actors, especially the worst affected, must be involved in the debate.

Dr Nuttall's slides are available at: <https://cil.nus.edu.sg/wp-content/uploads/2018/11/Session-2-Peter-Nuttall.pdf>.

115. In the following **discussion**, the moderator highlighted the participation of PSIDS at the UN in the BBNJ negotiations and the importance of the work of the International Law Association on sea level rise. With regard to the existential threat to small island states, it was pointed out by one delegate that it would be productive to look for solutions under the current system as well as change. There was also some discussion on the inclusion of these states at the IMO, as it was pointed out that the current rules disfavour those with less resources, both states and small NGOs.

116. Regarding MBMs, it was then highlighted that the pilotage scheme in the Torres Strait is an example of port entry requirements, as well as the post 9/11 port entry requirements in US and work of IMO in this regard, which may be a precedent for the potential EU action, though it was advised that the EU should be cautious of overplaying its hand.

117. It was highlighted that with regard to law of the sea issues, the EU could act and prevent port entry if ships do not meet the Directive requirements but member states cannot arrest ships or carry out enforcement for operational discharge in their waters (excluding internal waters). It was mentioned that fines and emissions trading as conditions of port entry are the possible solutions for the EU. It was mentioned that Arts 237 and 311(3) UNCLOS may provide for possibilities for action of the EU which might enhance legitimacy under UNCLOS for regional action. Another delegate then raised the point that it is probably not necessary to modify the obligations of states under UNCLOS in this regard.

118. A delegate raised the matter of what the exact competence of the EU actually is regarding shipping. It was pointed out that this is partially judge-made and very complex. It was highlighted that the best coordination happens at the IMO with EU member states if it is a looser arrangement. The coordination obligation of EU member states if EU interests are involved and the issue of weighted voting were pointed out. A delegate raised the issue of EU bloc voting and pointed out that it was controversial in previous MEPC meetings and causes issues with non-EU member states. A delegate then pointed out that this may have been in violation of IMO procedural rules.

119. Regarding an ETS for shipping, a delegate asked whether China, for example, or another region could also implement similar schemes. This was confirmed, and the problem of doubling MBMs for the same emissions was then highlighted.

120. A delegate also pointed out that there were concerns about the publication of EU data collection as it may damage shipping companies' interests.

Panel 7 Joint Panel Session – The Way Forward: National and Regional Strategy, Issues and Prospects

121. The final panel brought together experts from previous panels in order to give closing thoughts and ideas on the way forward, followed by further comments and discussion from delegates.

122. One of the speakers highlighted technology, benefit and costs, and the necessity to act and learn from mistakes rather than hesitate. It was noted that regarding ETSs, sector-only is easier, as it is politically less complicated. In reference to PSIDS and MBMs, it was emphasised that there is a need to be pragmatic. In the case where costs are low but benefits are large enough, then we should go ahead. It was emphasised that any MBM should not be a voluntary scheme, the IMO should regulate to avoid free riders.

123. From the perspective of Singapore, it was put forward that the MPA will likely incentivise industry where possible. The priority of alternative energy sources is ultimately undisputed; it can be the sole focus sooner or later but it was underlined that interim measures are also required. Regarding MBMs, the political reality at the IMO may hamper the enthusiasm for such measures that was shown at the workshop. The tension in negotiations and relationship with the UNFCCC were pointed out. It was suggested there was a need to be practical at the next MEPC, and focus on the available technical and operational measures, which would have a higher likelihood of agreement compared to MBMs. It was stated that the PSIDS' opinion is important to hear and is not heard often enough. The personal view of the speaker was that recognition by the IMO that inclusion is vital and should be facilitated, and is needed now.

124. One of the speakers took up the idea of an industry fund controlled by the IMO or industry, stating that shipping companies would pay directly (states' only role would be to ensure there is evidence that payment has been made). It was stated that no more favourable treatment would not apply if bunkering states would control the fund. The method suggested would be workable on a global basis. It was pointed out that there is some cynicism regarding why industry might want to create such a fund, but then highlighted that decarbonisation is recognised as necessary and must be done: such a scheme would only be a way of ensuring this process is on its way.

125. One of the speakers addressed the IMO Strategy as an expression of the will of states: International cooperation means the right thing is what the majority want to do. It was highlighted that the Strategy now shows what they want to do first. Although there has been a focus on mid and long term at workshop, it was noted that what was firmly agreed upon at the IMO was the short term measures over the next few years. It was highlighted that the task of the IMO is not the outcome but to assist member states to come to agreements: there is a willingness in the member states that the Strategy has real implications. It was noted that agreements will be reached by 2023 that will have implications on emissions, improve energy efficiency and introduce alternative fuels. It was stated that the ongoing efforts to reduce GHG emissions in various parts of the world, such as Singapore's Green Ship Programme, were very encouraging. It was emphasised that although the task is enormous and may breed pessimism, there is will to find solutions.

126. Another speaker pointed out that the IMO has managed to navigate difficult issues in the past well, but that this issue is different. It is not purely a shipping issue, but rather a much broader problem, with many issues at stake. It was noted that the solutions are also different to traditional solutions (such as technical rules) – and traditional ones are insufficient to deal with these issues. It was underlined that it has taken 20 years of discussion to get this far but now quick action is required, not necessarily interim measures that are later to be changed but rather discussion on what comes next must happen now, for example how to make

investment in green shipping profitable. The speaker argued that MBMs should be developed quickly, and that shipping might well need to be more expensive.

127. Another speaker emphasised that on the whole the Strategy and work of the IMO on GHG emissions should be encouraged. It was noted that IMO issues are complex, but shipping is always part of bigger, complex issues. It was pointed out that the IMO began as a small narrow institution and had hardly any rule making function. The role of IMO developed over time, many conventions were concluded, the environmental mandate increased, there was a greater security mandate, and the structures have evolved and grown. The organisation has been an adaptive, responsive organism over time: It has responded to global need. It was noted that the next stage of growth is in regulation of GHG emissions. This represents a movement into a new kind of demand on IMO: working with markets through MBMs, either just the MEPC or other parts of IMO. It was noted that the IMO is now challenged to respond, but it should be remembered that it is and always has been responsive. It was emphasised that time is running out and once we have the 4th GHG report, the new figures may well show that the initial Strategy is inadequate and there is a need to step up again (as we are currently working with 2012 data and out of date premises).

128. In the following **discussion**, many points were raised in response to these statements.

129. One delegate took issue with the idea that right thing to do is what the majority wants, as we cannot conscientiously submit PSIDS to the tyranny of the majority. It was noted that the 'majority' have not participated in the process anyway, as too many were excluded from process. It was emphasised that it is not a question of what majority wants but what is right.

130. One delegate put forward that the world community has already decided to tackle climate change and there are various roles in this process: it is the role of chair of the GHG Working Group at the IMO to ensure states continue to work towards this decision.

131. One delegate raised the issue of bunkering and the sulphur cap, noting that it should be addressed as its implementation is imminent, ship owners are concerned and the prices for cargo are increasing. It was noted that much has been said regarding a carbon tax and questioned why this did not occur earlier, rather than a sulphur cap. The negative impacts of rising costs and market volatility were highlighted, and it was pointed out that these will affect poorer countries the worst. With regard to bunkering, it was noted that real alternatives need to be properly assessed for the long term.

132. It was also highlighted by one delegate that there is an unanswered question: Although MBMs are a good way to go, the step change to reduce carbon footprint relies on availability of scalable technology and it is not clear that this exists. It was noted that there is a need to establish alternatives before MBMs make sense. The delegate also noted that what is being discussed is a much bigger issue than simply a marine problem: there is a similar discussion in the land transportation area regarding engine and fuel technology, and the problems with biofuel and LNG are known. It was pointed out that new alternative fuels have not received enough investment.

133. Another delegate pointed out that the technology exists but needs to be scaled: If we wait to introduce MBMs until the technology is ready, it will not have enough effect. It was emphasised that both MBMs and investment into R&D are necessary. It was noted that it is welcome to see this debate happening in Singapore and to discuss these issues in Asia, but more effort should be made to also have it in Latin America and Africa.

134. It was highlighted by one delegate that investment, technology, mature scaling up and market adoption is a slow process, and the funding for R&D is different for scaling up. It was noted that the market failure for R&D is known. It was recognised that to assume an MBM can bring technology from R&D to scaling up is questionable, but emphasised that an ambitious goal can drive innovation and demand that R&D will occur.

135. One delegate responded regarding the issue of scalable solutions, noting that there is some truth to the issue raised, but noted that shipping faces unique challenges, as there are currently solutions but they are not scalable and land solutions are not applicable. There is a need to scale up or down technologies to fit ships and MBMs or a donor fund could bring this about.

136. Another delegate underlined that optimism is required. He noted that the IMO agreement from April is compatible with a 1.5°C climate goal, but 50% reduction of emissions is only possible with new fuels and technological innovations. It was then noted that once these fuels and technologies were in place total decarbonisation would then occur in the next decade - in line with the 2018 IPCC Report. With regard to MBMs, it was noted that we are fighting a war on more than one front, and sulphur and CO₂ may need to be dealt with together: a global sulphur cap is equivalent to an MBM. It was submitted that the industry fund idea that had been suggested may just work and would raise billions.

137. One delegate underlined that with regard to raising prices, it is not the ship owners that would or should take the burden, but rather transport users. It was noted that they were absent from the workshop and general debate but need to be engaged.

138. It was noted by another delegate that discourse at the IMO is guided by 40-50 active states, but that inclusion is important, and although funding is limited, trust funds are insufficient. How to make these processes more inclusive was raised, as inclusion would also broaden the base for debate.

139. It was noted by one delegate that 102 states had participated at the last MEPC, but this could have been wider. It was noted that there are many advantages of the IMO system, but it does not have full global participation. The IMO membership has increased to 174 and the participation of all members in debate on GHG emissions is to be encouraged. However, it was also highlighted that smaller delegations face the problem of parallel sessions, as it is then challenging to participate in all.