Course to Zero Consultation: UK domestic maritime decarbonisation. Response from the Tyndall Centre, University of Manchester

Department for Transport

Course to Zero consultation: UK domestic maritime decarbonisation response form

Introduction

Thank you for responding. Your views will assist in informing the government's approach to accelerating domestic maritime decarbonisation.

Please fill in all relevant sections of this form, providing evidence where possible, and email it to: MaritimeTDPConsultation@dft.gov.uk.

Closing date is 06 October 2022.

Your details

1. Your (used for contact purposes only):

name:

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2. Are you responding:

☐ on behalf of an organisation?

Organisation details

Please answer the following questions (Q.3-6) if you are responding on behalf of an organisation.

3. What is your organisation's name?

Tyndall Centre for Climate Change Research, University of Manchester

4. Your organisation is best described as:

- [ ] A trade association or body?
- [ ] A business?
- [ ] A non-government organisation?
- [ ] A consultancy?
- [ ] A consortium?
- [x] Another type of organisation? (Please specify). UNIVERSITY

5. Who, if anyone, does your organisation represent? Please include the number of individuals that your organisation approximately represents.

This response is from shipping researchers at the Tyndall Centre for Climate Change Research, University of Manchester: Simon Bullock, Alice Larkin, James Mason. All views contained with this response are attributable solely to the authors and do not necessarily reflect those of researchers within the wider Tyndall Centre.

Response

The comments in this response cut across many of the questions in the consultation. To avoid repetition, this response is set out in pages 2-7 below and focuses on 5 points: on ambition, feasibility, scope, technology, and accounting. These points mainly address questions 1, 2, 4, 10, 21 and 22.

Summary:

Ambition:

- For compatibility with the Paris Agreement goals, the UK should set a domestic shipping emissions reduction target of 50% CO_2 cuts by 2030 on a pathway to zero emissions by 2040.

Feasibility:

- The modelling underpinning the Clean Maritime Plan should be reassessed in light of the Government's revised values for carbon in policy appraisal, issued in September 2021. These new values imply that 90% of business-as-usual emissions in 2030 can be cost-effectively abated.

Scope:

- This consultation focusses solely on domestic shipping. Measures to support domestic shipping decarbonisation will often help to reduce the UK's international shipping emissions also. It is essential that next year's Clean Maritime Plan refresh includes an explicit strategy to reduce the UK's international shipping emissions, with measures that specifically complement the UK's diplomatic efforts at the IMO, and in line with the UK's new inclusion of international shipping emissions in its carbon budgets.

Technologies:

- Shore power can deliver co-benefits of lower greenhouse gas emissions, and also improved local air quality in ports. It is also an enabling technology for the greater uptake of hybrid and fully-electric vessels. Electric vessels have great potential for domestic and short-sea shipping, which are major elements of UK shipping. In the absence of strong carbon pricing from the IMO, UK policy intervention is needed to accelerate shore power deployment, in the form of government grants and reductions in electricity taxation. Wind-assist technologies have greater abatement potential than has been previously assumed, and their deployment can be accelerated with targeted UK policy support.

Accounting:

- Well-to-wake GHG emissions should be accounted for, not just tank-to-wake CO_2 emissions. The UK now includes international shipping emissions in its carbon budgets, and a more accurate method for calculating the UK's share of internationals shipping emissions needs to be introduced. UKMRV reporting should include UK-European Economic Area (EEA) emissions.

Detail:

1 Ambition

It is cumulative carbon dioxide emissions that will primarily determine whether the Paris Agreement temperature goals will be met. Consequently, the pathway to zero emissions is pivotal, not just the end goal.

Tyndall research[i] calculates international shipping pathways compatible with the Paris 1.5^{o}C goal (Figure 1 below). Delays to emissions reductions mean far steeper reduction pathways are necessary in later decades. Given the slow turn-over of the fleet and the longevity of shipping assets[ii], pathways involving delay have emissions reductions profiles in the 2030s that will be too steep to be feasible. Consequently it is essential that shipping sector prioritises emissions reductions this decade – the research concludes that international shipping needs to cut its emissions to zero before 2050, with one third of these cuts delivered by 2030: the green pathway in Figure 1 below.

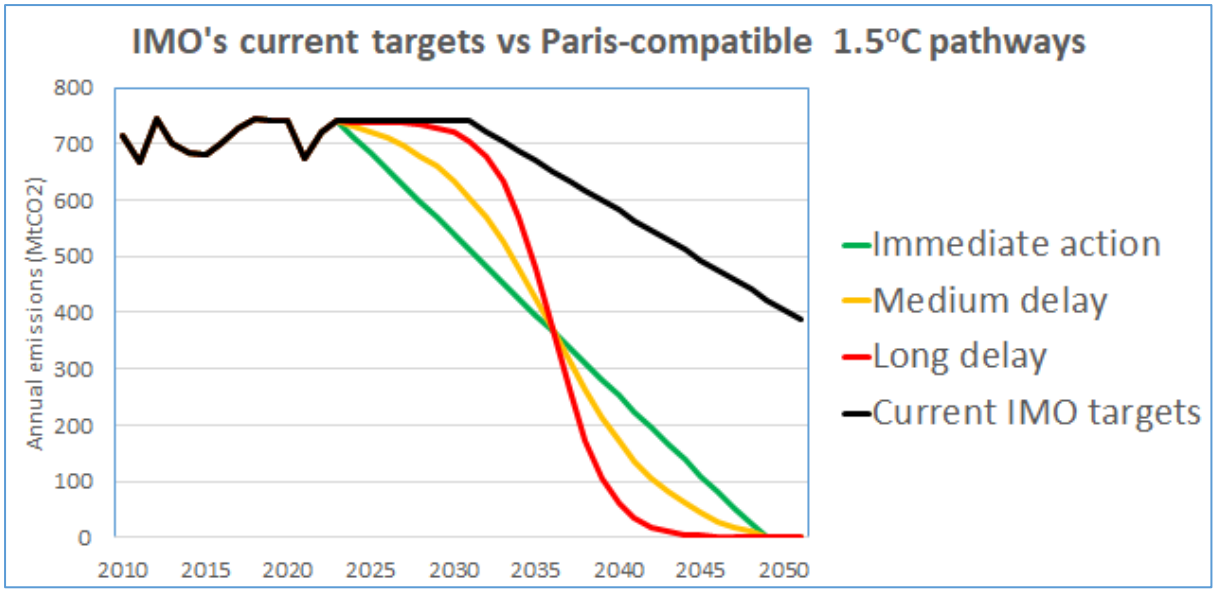

Figure 1: Paris compatible pathways for international shipping.

Further Tyndall research as part of the CS-NOW project to BEIS[iii] assesses the implications of these global shipping pathways for UK domestic and UK international shipping emissions. Because of the UNFCCC principles of differentiated responsibility, the UK should act more quickly than the global average, as it is a nation with greater historic responsibility for emissions and greater capability to reduce its emissions.

As a result, although the pathways in Figure 2 of the DfT consultation have broadly the right end-goal (zero emissions between 2040 and 2050), the consultation assumption of zero emissions reductions until 2030 is not Paris-compatible. Deep emissions cuts in the 2020s are essential. Such Paris-compatible pathways should also inform the setting of size of the overall annual emissions budgets when the UK includes domestic maritime within the UK ETS.

2 Feasibility

We note that the assumption of an absence of emissions reductions in the 2020s for both the UK's domestic and international shipping emissions in this consultation is taken from the original 2019 Clean Maritime Plan modelling. These CMP modelling assumptions were also adopted by the CCC in their 6th Carbon Budget report[iv]. However these assumptions should not be taken as a given – policy interventions and industry actions can and should be deployed to lower emissions this decade. For example, the original CMP modelling assumes that 38% of business as usual domestic shipping emissions in 2031 can be abated at less than £88/tCO2e[v], which was the BEIS policy appraisal price for carbon for that year.

We further note that these MACC curves need to be updated to reflect the changes to the Government's policy on carbon price methodology. In 2021, to reflect the move to a net-zero target, the values for carbon prices in policy appraisal were updated and greatly increased[vi]. These new carbon values imply that it is now justified to abate around 90% of 2031 business as usual emissions.

Our main response to this consultation is that it is both imperative and feasible that the UK sets targets and enacts policies to cut domestic and international shipping emissions by 50% by 2030, on a pathway to zero emissions by 2040.

3 Scope

We note that the consultation explicitly states that international maritime emissions "*are out of scope since they are regulated by the International Maritime Organisation*". However, the UK now has a legal duty to reduce international shipping emissions, given their inclusion in the 6th Carbon Budget. If the UK Government is not including a strategy on the UK's share of international shipping emissions in this Course to Zero strategy, it should do so as part of the broader Clean Maritime Plan refresh next year. UK targets for deep and rapid decarbonisation of the UK's share of international shipping emissions can be entirely compatible with efforts at the IMO level to address international emissions, and with the UK's ongoing diplomatic efforts to strengthen IMO ambition and policy. For example, as Course to Zero notes, the UK has championed Green Corridors through the Clydebank Declaration, a policy intervention outside of the IMO. Many of the policies to address domestic maritime emissions would also help reduce international maritime emissions. The UK could lead further efforts to accelerate global maritime decarbonisation – such as through the expertise within the UK on shipping contract law to ensure that charter contracts cover environmental issues as well as safety, or through multi-lateral coalitions to decarbonise North Sea short-sea shipping.

In summary, there is a major opportunity for UK leadership at a middle level - between actions to cut domestic emissions, and actions to deliver policy at the IMO. Addressing this gap would be entirely compatible and complementary with a strategy to influence the IMO's suite of policy options.

4 Technologies: Shore power and wind-assist

Shore-power cuts ships' use of fuel at berth, by allowing them to connect to land-side electricity grids, rather than using their auxiliary engines to provide the energy they need while in port. It is an option that can deliver short-term CO_2 reductions and help meet the Government's air quality goals. It is also an essential enabling technology for the greater use of hybrid and fully-electric vessels, allowing battery recharge.

Shore power uptake is low in the UK, with a set of barriers to uptake set out in Tyndall's recent response to the Government's shore power call-for-evidence[vii] and in previous research on shore power[viii]. Shore power projects are capital-intensive, and ports struggle to recoup these costs because shore power faces high electricity costs and taxation, and marine fuel oil is untaxed by global agreement. Other countries address these barriers through providing capital funding, and by removing taxes on shore-power electricity[ix]. The UK is in a position to take a similar approach. Joint evidence to the Government's shore power call-for-evidence from Tyndall, the Port of Aberdeen and Buro Happold set out a case-study for how Government policy on taxation and grant funding would improve shore power project economics at Aberdeen[x]. Policy support on shore power would also address an imbalance between transport modes in the UK, where for example road transport has had multi-billion pound support from Government for electric charging infrastructure.

We note also that electric ships will require shore power connections for battery recharge. Hybrid and fully-electric ships are cited as a mitigation option in the original CMP, however their potential is likely to be greater than assumed in the CMP because there have been major advances in battery density and on battery cost since the CMP was published: consequently the range for battery-powered vessels is increasing, and economics is improving. A recent paper by Kersey et al[xi] highlights that new electric container vessels are already cost-competitive with oil-fuelled vessels up to 1,500km, a range which extends to 5,000km if environmental benefits are included. Even at just

1,500km this is a major opportunity for short-sea shipping, both domestic and international, for the UK. As Kersey et al point out, four of the world's top-ten bilateral shipping trading relations are between ports on the North Sea, all are under 1,000km, and two of them involve the UK. This opportunity is also highlighted in a recent report by Siemens on potential ferry electrification, highlighting that the UK is one of four front-runner European countries for maritime electrification[xii]. These advances are both a further justification for UK policy support for shore power, but also for Government leading a strategy with shipping stakeholders in the UK and also mainland Europe for the greater deployment of electric vessels in both domestic and short-sea shipping, for example for multiple segments in North Sea shipping (containers, offshore, cargo).

Another mitigation option whose potential has tended to be downplayed is the use of wind-assist technologies. Wind propulsion technologies are available to install on new and existing ships today, which positions the technology as a solution that can help provide the urgent short-term emission reductions required to tackle cumulative shipping emissions. New Tyndall research demonstrates up to 24% carbon reductions in a year by employing a wind propulsion system on routes favourable for this technology[xiii]. The research highlights that some routes linked with the UK are particularly suitable, such as those in the North Atlantic Ocean[xiv] and North Sea[xv]. The UK is thus ideally situated to be an early adopter and future global leader of this innovative emerging technology.

Financial incentives would encourage the development of innovative demonstration projects for wind technology systems in the UK, particularly for small and medium enterprises (SMEs) of which there are many within the shipping sector. Moreover, providing innovative funding structures to early-stage sail developments, such as multi-stage funding programmes (e.g.[xvi]) which concentrate up to 100% funding to the most promising emerging solutions, is an important route for the UK to pursue. For example, sail developer Norsepower exemplify the case for early-stage funding; they received 100% funding from the Finnish government to develop a Flettner rotor and are now the leading sail providers in the industry. Other promising sail types, such as wing sails and kites, are currently in earlier development phases so developers can struggle to secure funding to develop a test rig given private sector investors are typically reluctant to invest in early stage, risky or expensive technologies. This delays the development of this important technology opportunity with its realistic potential to make significant cuts in CO_2 in the near term. Wind propulsion systems would therefore benefit from funding mechanisms that provide a substantial faction of the total funding requirements to advance and demonstrate the capabilities of these emerging solutions. The UK government needs to support investment in wind propulsion technology systems to support and develop emerging UK companies in this promising new sector.

5 Emissions accounting

Tyndall shipping emissions pathways analysis focusses on CO_2, as the IPCC uses this metric in setting out global carbon budgets for particular temperature outcomes, with built-in assumptions for reductions of other greenhouse gases. It is imperative therefore that measures to cut CO_2 emissions from ships do not lead to increases in other greenhouse gases (GHGs), or to increased CO_2 impacts upstream. We support ongoing efforts at the IMO to ensure that full lifecycle emissions accounting is used – for example well-to-wake GHG emissions, rather than far narrower tank-to-wake CO_2 emissions accounting.

We also note that there are methodological difficulties in determining the relative split between domestic and international shipping emissions, and in particular in assigning international shipping emissions between nations. The complexities of alternative indicators have been set out in previous research for the Clean Maritime Plan[xvii], by the Tyndall Centre[xviii] and by the Climate Change

Committee[xix]. The recent IMO 4th Greenhouse Gas report[xx] advocates a new "voyage" based approach to splitting global shipping emissions into domestic and international categories; this aligns exactly with IPCC guidance, and also aligns with the reporting used in the EU MRV and UK MRV systems. Ascribing a share of international shipping emissions to a particular nation is more complex. The current approach for UK international shipping emissions – based on bunker fuel sales – is inaccurate and a significant underestimate due to the major use of bunkering abroad, for example at Rotterdam, rather than the UK, for international journeys involving the UK. As part of the Clean Maritime Plan refresh, the Government should set out a process for accurately calculating the UK's share of international shipping emissions that aligns with both the IPCC guidelines and other emissions reporting systems such as EUMRV and UKMRV.

The UK's MRV system should also require reporting of emissions for journeys between UK and EEA ports. These emissions will be reported to EUMRV, and the argument has been put forward that not doing so in the UK MRV would "avoid duplication". However, the issue of duplication is not relevant from a policy perspective, as the UK ETS does not intend to include these emissions, and it would hardly be an administrative burden, as entities will already be submitting the same information to the EU using the same spreadsheet template. However, it is necessary to include UK and EEA emissions reporting so as to obtain a comprehensive inventory of international shipping emissions related to the UK, i.e. including UK-EEA journeys as well as UK-non EEA journeys. It would not necessarily be easy to simply obtain this data from the EU, as the EU will aggregate UK-EEA journeys into the broad category of EEA-non-EEA journeys.

1. **What is your feedback on the overall ambition and feasibility of the Net Zero Strategy pathway for domestic maritime vessel emissions (see Figure 2)?**

Please see preceding sections 1,2,3 and 5 on ambition, feasibility, scope and accounting

2) **What role do you think the following alternative fuels and energies may play in decarbonising domestic maritime sector vessels (within your subsector, if appropriate)? What evidence do you have to support this opinion?**

Please see preceding section 4 on shore power and wind-assist technologies

4) How should the technological transitions required to decarbonise the domestic maritime sector best be supported? What evidence do you have to help refine our understanding in this area?

Please see preceding section 4 on shore power and wind-assist technologies

10. Are there any additional interventions targeting economic barriers that the government could explore introducing to complement and enhance our current approach, in the short, medium, and long term?

Please see preceding section 4 on shore power and wind-assist technologies

21. Do you have any other comments to share with us, about any aspect of domestic maritime decarbonisation?

Please see preceding sections 3 and 5 on scope and accounting

22. Do you have any other comments?

Please see preceding sections 3 and 5 on scope and accounting. To reiterate our main point from sections 1 and 2. **Our main response to this consultation is that it is both imperative and feasible that the UK sets targets and enacts policies to cut domestic and international shipping emissions by 50% by 2030, on a pathway to zero emissions by 2040.**

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[i] Bullock, S., Mason, J., Larkin, A., 2021. The urgent case for stronger climate targets for international shipping. Climate Policy, Vol. 22, issue 3. https://doi.org/10.1080/14693062.2021.1991876

[ii] Bullock, S., Mason, J., Broderick, J., Larkin, A., 2020. Shipping and the Paris climate agreement: a focus on committed emissions. BMC Energy 2(1): 1-16.

[iii] UCL and Tyndall, 2022 (forthcoming). Maritime Review. A review of existing evidence on maritime emissions reduction pathways, in support of the UK government contributions to the revision of the IMO's Initial Strategy for GHG Reduction. CS-N0W consortium.

[iv] Climate Change Committee, 2022. The Sixth Carbon Budget. Shipping. https://www.theccc.org.uk/wp-content/uploads/2020/12/Sector-summary-Shipping.pdf

[v] Smith, T., et al, 2019. REDUCING THE MARITIME SECTOR'S CONTRIBUTION TO CLIMATE CHANGE AND AIR POLLUTION Scenario Analysis: Take-up of Emissions Reduction Options and their Impacts on Emissions and Costs. A Report for the Department for Transport. Page 23

[vi] BEIS, 2021. Valuation of greenhouse gas emissions: for policy appraisal and evaluation. September. https://www.gov.uk/government/publications/valuing-greenhouse-gas-emissions-in-policy-appraisal/valuation-of-greenhouse-gas-emissions-for-policy-appraisal-and-evaluation

[vii] Tyndall Centre for Climate Change Research University of Manchester, 2022. Submission to Department for Transport call-for-evidence on shore power. April.
[viii] Bullock, S. 2020. Barriers and solutions for UK shore-power. Tyndall Centre for Climate Change Research, University of Manchester. power https://mailchi.mp/britishports/tyndall-report
[ix] Tyndall Centre for Climate Change Research University of Manchester, 2022. Submission to Department for Transport call-for-evidence on shore power. April.
[x] Tyndall Centre Manchester, Port of Aberdeen and Buro Happold, 2022. Submission to Department for Transport call-for-evidence on shore power. April.
[xi] Kersey, J., Popovich, N., Phadke, A., 2022. Rapid battery cost declines accelerate the prospects of all-electric interregional container shipping. Nature Energy 7, 664–674. https://doi.org/10.1038/s41560-022-01065-y
[xii] Siemens Energy, 2022. Decarbonizing maritime transport. A study on the electrification of the European Ferry Fleet.
[xiii] Mason, J. 2021. Quantifying voyage optimisation with wind-assisted ship propulsion: a new climate mitigation strategy for shipping. Doctoral thesis, The University of Manchester.
[xiv] Mason, J. 2021. Quantifying voyage optimisation with wind-assisted ship propulsion: a new climate mitigation strategy for shipping. Doctoral thesis, The University of Manchester.
[xv] Traut, M., Gilbert, P., Walsh, C., Larkin, A., Filippone, A., Stansby, P.K. & Wood, F. Propulsive power contribution of a kite and a Flettner rotor on selected shipping routes. Appl. Energy 113, 362–372 (2014).
[xvi] EuropeWave, *About the project*; https://www.europewave.eu/about-the-project (accessed October 2022)
[xvii] Smith, T., et al, 2019. REDUCING THE MARITIME SECTOR'S CONTRIBUTION TO CLIMATE CHANGE AND AIR POLLUTION Scenario Analysis: Take-up of Emissions Reduction Options and their Impacts on Emissions and Costs. A Report for the Department for Transport. Section 2.2, and Technical Annex, Section 3.4
[xviii] Gilbert, P., and Bows, A., 2012. Exploring the scope for complementary sub-global policy to mitigate CO2 from shipping. Energy Policy, Vol. 50, pages 613-622. https://doi.org/10.1016/j.enpol.2012.08.002
[xix] Climate Change Committee, 2011. Review of Shipping Emissions. https://www.theccc.org.uk/wp-content/uploads/2011/11/CCC_Shipping-Review_single-page_smaller.pdf
[xx] Faber, J., et al, 2020. Fourth IMO greenhouse gas study. London: IMO.