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Decarbonising Shipping – Policy Briefing

In this briefing, researchers from the Tyndall Centre for Climate Change Research at the University of Manchester set out ten recommendations for how the UK's planned Clean Maritime Plan refresh can align with Paris Agreement goals, while also delivering air quality improvements. This strategy refresh needs to focus on delivering deep cuts in emissions this decade, for which stronger policies and greater funding are required, with a rapid transition from research and development to project and technology deployment.

Summary

- It is essential that the 2023 refresh of the Clean Maritime Plan (CMP) sets clear timebound targets and strong policies for UK maritime decarbonisation;
- Research by Tyndall Manchester says the UK should aim for 50% carbon dioxide (CO₂) emissions reductions by 2030, and zero emissions by 2040, for both the UK's domestic and international shipping activities;
- Alternative fuels are essential, but lifecycle assessment is needed to guide deployment towards fuels that offer genuine emissions reductions and overall sustainability benefits;
- CO₂ reductions in shipping are currently hard to deliver, given the competitive advantages for low taxed marine fuel oils. Greater capital funding and a package of economic instruments are therefore needed to deliver mitigation measures;
- CO₂ reduction measures in ports such as shore power have important co-benefits of reduced air pollution;
- Wind-assist technologies are a hitherto underestimated solution that can provide major greenhouse gas reductions in the short-term, as well as reducing other harmful emissions, while future-proofing ships from risks involved with switching to alternative fuels.

Targets, ambitions and accounting for international and domestic emissions

The absence of targets in the UK's 2019 Clean Maritime Plan (CMP) leaves no clear goals to guide progress and policy development. The Government's intention to refresh the CMP by 2023 is an opportunity to address this problem.

Tyndall [research](#) calculates that it is not possible to leave shipping decarbonisation until the 2030s, as the required emissions trajectories in the 2030s to stay compatible with the Paris 1.5°C goal would become so steep as to be infeasible. Deep emissions cuts in the 2020s are therefore essential.

Recommendation one: Cuts in global shipping CO₂ emissions of at least a third are needed by 2030¹. UNFCCC principles of responsibility and capability require the UK to

set stronger targets than the global average, implying 50% reductions on 2008 levels by 2030, on a pathway to zero emissions by 2040.

The UK's 2021 Transportation Decarbonisation Plan set a 2050 shipping target, but only for domestic shipping. However, the UK has legislated to include the UK's domestic and its share of international shipping emissions in its carbon budgets.

Recommendation two: The UK should set targets for both international and domestic shipping emissions.

The UK currently measures its share of international shipping emissions on the basis of UK fuel sales for use on international journeys. This is inappropriate for a country like the UK, due to the proximity of easy refuelling nearby, for example at Rotterdam. This method skews the UK's true contribution and will distort effective policy making unless addressed.

Recommendation three: A voyage-based approach would provide a more accurate means to calculate the UK's share of international shipping emissions, aligning with methodological improvements now used at global and EU levels to estimate international shipping emissions.

Alternative fuels

Alternative fuels will play a pivotal role in decarbonising the shipping sector and their potential impacts are wider than just reducing greenhouse gas (GHG) emissions.

Recommendation four: Full life-cycle assessment of the impacts of marine fuels is required – including fuel production, storage, transportation and disposal, as well as use. Other environmental impacts beyond climate change should be accounted for using life-cycle assessment tools to help mitigate other impacts, for example ecological impacts on land, toxicity and NO_x/SO_x emissions. This is essential to ensure indisputable greenhouse gas savings and holistic improvements in economic, social and environmental sustainability.

Three examples highlight the importance of these issues:

- LNG's use in shipping has increased as it reduces pollution such as SO_x. It also emits less CO₂ than fuel oils when burned. However, **methane leakage on ships and in natural gas infrastructure can negate these savings. Even if this leakage is prevented, LNG is still a very high-carbon fuelⁱⁱ. Given the scale of the Paris Climate Agreement goals and the speed of transition required, such vessels risk becoming stranded assets.** While LNG as a ship fuel is being phased out, efforts should be made to minimise methane leakage.
- **Accounting for emissions at all life-cycle stages:** Producing hydrogen from natural gas results in fugitive emissions, which should be fully monitored, alongside monitoring of the variable levels of CO₂ emissions at the carbon capture and storage (CCS) stage of Blue Hydrogen production. Hydrogen produced from the electrolysis of water using renewable energy (Green Hydrogen) offers the lowest upstream greenhouse gas emissions.

- Biofuel production and use on ships should only be promoted when there is a guarantee that the feed-stocks used can be sustainably sourced, and that the supply chain offers a significant reduction in greenhouse gas emissions on a life-cycle basis.

Recommendation five: Life-cycle assessment is necessary beyond just fuels. A circular economy approach can help ensure the shipping industry's transition to zero CO₂ emissions is sustainable. Ships' end of life stages should be considered during design to ensure they are aligned with climate and sustainable development goals.

UK strategy and policy support

In the three years since the Clean Maritime Plan, policies to help shipping and ports decarbonise have been slow to materialise. There are signs that the pace is picking up – the recent creation of the UK-SHORE unit, the £23m Clean Maritime Demonstration Competition research and development (R&D) fund, and its £12m second phase are very welcome. But the urgency of the challenge requires a rapid move from R&D to deployment, for which a broader and more substantial package of measures is required. The planned CMP refresh in 2022 is a prime opportunity to create a policy package that delivers short and long-term emissions reductions, as well as economic and employment benefits.

Recommendation six: The CMP should back-up stronger targets with a package of supportive economic instruments, including greater funding that goes beyond R&D to focus on deployment.

The Treasury's Green Book puts a value on carbon savings, to guide whether climate policies have net societal benefits. This value tripled in the Government's 2021 updateⁱⁱⁱ, but the CMP uses the old values. The CMP showed that the societal benefits outweighed the costs for 26-34% of possible shipping emissions reductions in 2031^{iv}. The updated values now mean that 90% of emissions reductions have net benefits.

Recommendation seven: The Government should update the modelling underpinning the CMP to reflect its new carbon valuation policy, and ensure the strategy includes policies to deliver these societally-beneficial emissions reductions.

Recommendation eight: The recent proposal to include domestic maritime emissions in the UK emissions trading scheme (ETS) is welcome, but this should be extended to include the UK's share of international shipping emissions also, aligning with proposals for expansion of the EU ETS.

In 2019 the Government issued guidance for ports to produce Port Air Quality Strategies, but despite many ports submitting draft plans to the Department for Transport (DfT), there has been little movement from Government since. The CMP refresh offers the chance to integrate measures in ports to tackle both air quality and greenhouse gas emissions.

Shore power is a prime technology for cutting pollution in ports and paves the way for greater electrification of short-sea shipping. The UK Government launched a consultation in February 2022 on possible policy support for shore power. Tyndall [research](#) sets out barriers to UK shore-power deployment and solutions to them.

Recommendation nine: The DfT should make Port Air Quality Strategies mandatory, and provide support for port infrastructure investment, including grant funding for UK

shore power projects, as in other countries. It should also reduce taxes on shore power electricity, in line with other European countries, to enable shore power projects to compete more fairly with far less taxed marine fuel oils.

Recent Tyndall [research](#) demonstrates up to 24% carbon dioxide emission reductions in a year by employing wind propulsion systems that incorporates route optimisation. This also cuts other harmful emissions. The research highlights some routes linked with the UK are particularly suitable for this technology, such as those in the North Atlantic and North Sea. The UK is ideally situated to be an early adopter and future global leader of this innovative emerging technology.

Recommendation ten: Investment in wind propulsion technology systems by the UK Government to support and develop emerging UK companies in this promising new sector.

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Further detail is found in the 2022 Tyndall Manchester [submission](#) to the Transport Select Committee inquiry into Maritime 2050.

ⁱ Reductions against 2008 levels

ⁱⁱ Balcombe, P, et al. "How can LNG-fuelled ships meet decarbonisation targets? An environmental and economic analysis." *Energy* 227 (2021): 120462. Sharafian, A, et al. "Natural gas as a ship fuel: Assessment of greenhouse gas and air pollutant reduction potential." *Energy Policy* 131 (2019): 332-346.

ⁱⁱⁱ BEIS, 2021. Valuation of greenhouse gas emissions: for policy appraisal and evaluation. September.

^{iv} 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. Figures 5 and 6.