

OIKOS MARINE & SOUTH SIDE DEVELOPMENT



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Appendix 13.2: Modelling GHG Emissions from Shipping

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Policy Background

- 1.1 Shipping is an international sector and the UNFCCC, the global body managing climate change has determined that the IMO is responsible for managing GHG emissions from international shipping consistent with its own policies and objectives, including the Paris agreement on climate change.
- 1.2 In this respect the IMO has agreed a long-term target to reduce global international shipping GHG emissions by at least 50% by 2050, including a 2030 carbon intensity target (a 40% improvement from 2008 levels), as well as agreeing to new energy efficiency requirements from 2023 and mandatory carbon intensity targets from 2026. It is also examining options to fully decarbonise in the longer term.
- 1.3 The UK has committed to net zero GHG emissions by 2050 and accepts that this target implicitly includes international aviation and shipping albeit those emissions are not formally included within the target nor carbon budgets. The approach presently is to allow a headroom allowance for these sectors which requires other sectors to reduce their emissions further.

UK shipping emissions trends

- 1.4 The latest CCC review of shipping¹ shows that shipping emissions accounted for 3% of UK GHG emissions in 2018 and were 21% below 1990 levels. Emissions have therefore been on a slow downward trend over the past two decades, with the past decade seeing reductions in domestic journeys around the UK coast and in international export shipping, plus falls in naval shipping. 2020 has seen a drop in GHG emissions, due to the impact of COVID-19, with a return to pre-pandemic levels expected in 2022.
- 1.5 Based on the most recent year of official UK emissions data, total UK shipping emissions increased by 0.2% from 2017 to 14.3 MtCO₂e/year in 2018. Emissions from international journeys fell by 0.2% to 7.9 MtCO₂e/year, emissions from domestic journeys increased by 0.2% to 5.9 MtCO₂e/year, and emissions from naval shipping increased 6% to 0.5 MtCO₂e/year.
- 1.6 The CCC have also estimated UK shipping emissions for 2019 at 14.3 MtCO₂e/year, a 7% decrease from 2018 levels. This is distributed as a 10% fall in domestic shipping emissions, a 5% fall in international shipping emissions and an 11% fall in naval shipping emissions

¹ CCC, Policies for the Sixth Carbon Budget and Net Zero, 2020

CCC views on decarbonisation of shipping

- 1.7 The CCC have reviewed future potential for technological and fuel decarbonisation of the shipping sector to inform their 6th carbon budget. This includes the development of a number of future pathway scenarios to 2050, summarised below as Figure 1.1.

Figure 1.1: CCC pathway scenarios for shipping

Table M9.1 Shipping scenario choices							
	UMAS scenario	Use of zero-carbon fuels (TWh, % of fuel demand in 2035)	Use of electricity (TWh, % of fuel demand in 2035)	Use of fossil marine fuels (TWh, % of liquid fuel demand in 2035)	Use of zero-carbon fuels (TWh, % of fuel demand in 2050)	Use of electricity (TWh, % of fuel demand in 2050)	Use of fossil marine fuels (TWh, % of liquid fuel demand in 2050)
Balanced Net Zero Pathway	D	22 (34%)	1 (2%)	42 (65%)	70 (91%)	3 (4%)	4 (5%)
Headwinds	D	22 (34%)	1 (2%)	42 (65%)	70 (91%)	3 (4%)	4 (5%)
Widespread Engagement	B	0.9 (1%)	0.6 (1%)	64 (98%)	70 (91%)	3 (4%)	4 (5%)
Widespread Innovation	C	38 (58%)	2 (3%)	26 (40%)	70 (92%)	3 (4%)	3 (4%)
Tailwinds	C	38 (58%)	2 (3%)	26 (40%)	70 (92%)	3 (4%)	3 (4%)
Baseline	A	0 (0%)	0.1 (0.1%)	68 (99.9%)	0 (0%)	0.2 (0.2%)	84 (99.8%)

- 1.8 All the scenarios, with the exception of the baseline show the shipping sector decarbonizing so that by 2050 less than 5% of marine fuels are fossil based. The CCC therefore expect that the shipping sector can achieve very close to full decarbonisation in all scenarios by 2050.
- 1.9 Specifically, they have modelled only very small residual emissions (<1 MtCO₂e/year) from a very limited use of fossil fuels in 2050, and around half of these residual emissions are in naval shipping, due to no decarbonisation options being modelled in this sub-sector.

IMO data on shipping efficiency

- 1.10 The IMO have recently published a comprehensive study² examining historic fuel efficiency of international shipping. This examined GHG intensity of shipping between 2008 and 2018 and concludes that over this period the GHG intensity of shipping (measures as CO₂/t/nm) has improved by circa 30% over that period. This indicates that the sector is well placed to meets its targets of 40% efficiency improvement by 2030 relative to 2008.
- 1.11 Figure 1.2 below summarises IMO data on shipping carbon intensity over the period 2008 to 2018.

² IMO, Reduction of GHG Emissions from Ships, Forth IMO GHG Study, 2020

Figure 1.2: CCC IMO Data on Carbon intensity of international shipping

Year	EEOI (gCO ₂ /t/nm)			
	Vessel-based		Voyage-based	
	Value	Change	Value	Change
2008	17.10	—	15.16	—
2012	13.16	-23.1%	12.19	-19.6%
2013	12.87	-24.7%	11.83	-22.0%
2014	12.34	-27.9%	11.29	-25.6%
2015	12.33	-27.9%	11.30	-25.5%
2016	12.22	-28.6%	11.21	-26.1%
2017	11.87	-30.6%	10.88	-28.2%
2018	11.67	-31.8%	10.70	-29.4%

- 1.12 Improvements in carbon intensity of international shipping have not followed a linear pathway and more than half have been achieved before 2012. The pace of carbon intensity reduction has slowed since 2015, with average annual percentage changes ranging from 1 to 2%.

Modelling shipping emissions in the 2025 scenario

- 1.13 The review of GHG carbon intensity of the shipping sector presented above demonstrates that:
- The international shipping sector is subject to regulation driving short- and longer-term carbon efficiency improvements;
 - The sector is on track to achieve its 40% efficiency improvement target by 2030 (relative to 2008);
 - The pace of decarbonisation has been faster prior to 2012 (at roughly 5% per annum) but still remains at 1-2% per annum for the period 2012 to 2018; and
 - Longer term modelling demonstrates that the sector is expected to fully decarbonise by 2050.
- 1.14 For the purposes of modelling GHG emissions from vessels the following assumptions have therefore been adopted.
- 1% per annum vessel GHG efficiency improvements from the current 2019 baseline until the modelled scenario in 2025; and
 - UK shipping is fully decarbonised by 2050.