



CHAPTER 7: SHIPPING SECTOR



7 SHIPPING SECTOR




GENERAL OVERVIEW

The transition risk story for the shipping sector articulates itself along three trends:

- **Demand increase.** The increasing relevance of global supply chains and the expansion of trade routes will likely drive the increase of the sector’s demand (GMT 2013). These factors will however have limited impact on fossil fuel forecasts in scenarios where there is high exposure to transition risks.
- **Energy Efficiency improvements.** Efficiency improvements will come from the implementation of technologies for fuel control, instrumentation and navigation, as well as from operational changes. Efficiency measures will be pushed by the industry itself and by market standards. Both have the potential to reduce 40% of the sector’s emissions by 2040.
- **Increase in the emissions control areas and gases in scope.** Currently areas with emission controls are set up in the North and Baltic sea, US, Canada and some regions in China. The International Maritime Organization (IMO) is not only looking towards the increase of control areas and the maximum gas limits allowed but as well to extending the global requirements (e.g. global maximum sulphur content from 3.5% to 0.5% from 2020). Abiding to regulation will thus require manufacturers to implement new reduced pollutant technologies.

The scenarios developed here take the results of UMAS 2016. UMAS develops 10 scenarios of which 4 solved for a carbon budget that follows a 2°C pathway and 1 scenario for a carbon budget that droves to be aligned with a LCT scenario (i.e. scenario 10) when comparing it in the range of calculated⁵ carbon budget values of RCP 4.5 and 6.0 pathways. Scenario 10 is however very ambitious in the share of biofuel penetration and allows up to 80% of carbon offset purchase. This scenario is presented to keep consistency among assumptions and allow comparison between scenarios. Analysts can as well refer to the alternative scenarios mentioned in the chapter, but should keep in mind possible inconsistencies.

The scenario involves the following parameters:

	PRODUCTION & TECHNOLOGY Shipping Transport Demand (G tonne-km / year) Fuel efficiency (kJ/tonne-km) Alternative Fuels Penetration (%)
	MARKET PRICING Marine Fuel prices (fraction to 2010 HFO price and USD/GJ)
	POLICY MANDATES, INCENTIVES & TAXES Efficiency Design Standards

5 THINGS BEFORE GETTING STARTED

- 1. Sector Segmentation.** In 2012 emissions from international shipping accounted for 85% of the total sector's emissions. The demand analysis is focused on international shipping as the sector is driven mainly by global trade and thus is dependent on the international market behavior.
- 2. Split Responsibility.** Shipping cargo transportation occurs under two main types of contracts:⁶ the voyage charter contract between ship-owners/operators and the time charter contract with charterers within the freight market. The costs structure for both contacts is different. The voyager charter hires the vessel in a per-ton scheme, where the ship owner pays for energy, crew and port costs. The time charter contract involves hiring the vessel on a daily rate, thus covering energy and port costs, while the ship owner covers crew cost. These arrangements split the responsibility of costs (i.e. split incentives) making the cost pass-through of implementing fuel efficiency and fuel switching measures in the industry complex compared to other industries. Incentives towards implementing measures thus change according to the type of contract.
- 3. Economic Viability of Efficiency Measures.** Most of the fuel efficiency technologies and operational measures that are currently available are already economically viable (ICCT 2013). Economic viability of the measures is subject to non-cost driven barriers (i.e. split incentives and operational information reliability) and the learning curve that technologies will take. No scenarios known to the authors models changes in technology costs. Quantifying the costs is thus an important missing piece in the analysis.
- 4. Policy Development.** Recent efforts towards enabling data collection on company-related emissions (i.e. SEEMP, EVDI) will benefit policy creation and monitoring by providing a baseline that enables the identification of needs for operational and technology improvements and fuel switching. Consequently, further regulation and developments of standards in the sector is expected.
- 5. Effect of Air Pollution Regulation.** Air pollution regulations in NO_x and SO_x –although they are not part of the GHGs– have an effect in the CO₂ intensity of the vessels. The measures that shippers will adopt (i.e. solar and wind power and biofuels) to comply to current and future regulation will have an important impact in the emissions reduction of the sector.

7.1 SHIPPING TRANSPORT DEMAND



Overview. The analysis of demand for shipping transport considers two transport segments: fossil fuel (i.e. oil and coal) and cargo transportation. Under risk scenarios, the modelling of fossil fuels transport should consider transition drivers that steer oil and coal consumption. Cargo transport can still be modelled based on economic growth assumptions as the operation of this segment is not directly affected by transition risks.

Risk pass-through mechanisms. Changes in demand will have a direct impact on company revenues. In the transition to a low carbon economy, companies whose operations are concentrated in the fossil fuel segment are more exposed and can expect to lose the most.

Sources. Demand for shipping transport is generally modelled on multi-sector scenarios such as the ETP and Greenpeace scenario, however results are often not disclosed (e.g. ETP 2016) or partially presented (e.g. the Greenpeace scenario only discloses results of inland navigation). Other scenarios focusing on transport or specifically on marine shipping base their projections in macroeconomic assumptions (e.g. OECD 2017, 2nd IMO GHG study), integrating in some cases assumptions around environmental policies and carbon prices (GMFT2030 2014). The first sector specific scenarios solving for a climate outcome have recently been published (e.g. 3rd IMO GHG study).

Method. In designing the LCT and ACT scenario, the Third IMO Study is used. This scenario is selected because it models the fossil fuel and cargo segment independently. The fossil fuel segment is modelled considering emission pathways using RCPs,⁷ while the cargo segment uses standard population and economic growth assumptions through IPCCs AR 5 socio-economic pathways (SSPs⁸). In the fossil fuel segment, the LCT can be described by RCP6.0 and the ACT by RCP2.6 and RCP4.5, representing respectively a maximum warming increase of 3.1°C, 2.6°C, and 1.7°C in 2100. In the cargo segment, both the LCT and ACT are described by SSP3, a world with slow technology development. This pathway is selected to be in line with UMAS 2016.

Results. Under an ACT, demand for oil and coal transport is expected to reach its peak in 2018 and decline to 2000 levels by 2050. Demand for fossil liquid-bulk will decline by 28% through 2040 compare to 2015 levels. Likewise, bulk-coal transport will decline by 52% through 2040 from 2015 (see Table 7.1). Total demand for cargo transportation is expected to increase by a growth factor of 1.8.

TABLE 7.1 GLOBAL TRANSPORT WORK BY TYPE OF TRANSPORT IN THE ACT AND LCT SCENARIOS (SOURCE: AUTHORS, BASED ON IMO3 2015)

Scenario	Type	2015	2020	2025	2030	2035	2040
ACT (RCP2.6)	Liquid Bulk oil	18 980	18 250	16 425	14 600	14 162	13 724
	Bulk coal	7 300	7 008	6 424	5 840	4 672	3 504
	TOTAL	26 280	25 258	22 849	20 440	18 834	17 228
ACT (RCP4.5)	Liquid Bulk oil	17 520	16 936	17 301	17 666	17 885	18 104
	Bulk coal	7 300	8 176	8 833	9 490	9 709	9 928
	TOTAL	24 820	25 112	26 134	27 156	27 594	28 032
LCT	Liquid Bulk oil	18 688	20 878	22 995	25 112	27 594	29 200
	Bulk coal	7 300	7 227	7 519	7 738	8 030	8 103
	TOTAL	25 988	28 105	30 514	32 850	35 624	37 303
ACT & LCT	Non-coal bulk dry	15 330	18 980	23 214	27 448	30 952	34 456
	Unitized cargo	24 236	33 580	43 435	53 290	64 532	75 774
	TOTAL	39 566	52 560	66 649	80 738	95 484	110 230

7.2 FUEL EFFICIENCY



Overview. Efficiency in the sector is determined by both technical and operational improvements. Technical improvements come from advancements in navigation, design efficiency and materials. Operational improvements relate mainly to speed reduction, weather routing and hull cleaning. The potential reduction in total CO₂ emissions after efficiency measures by 2040 respect to 2015 is of 35 to 40% depending of the type of ship (ICCT 2013).

Risk pass-through mechanism. Fuel efficiency gains result in the reduction of operational expenses via fuel consumption. Efficiency gains from technology improvements impact positively time charterers and could impact positively shipowners under a voyager contract provided the measures are cost effective. It is uncertain how shipowners expenses could be transferred to time and voyage charterers as tariff changes respond mainly to market forces (i.e. supply vs. demand). Time charterers have higher incentives to implement fuel efficient operational measures as these have a direct impact in their costs.

Sources. Fuel efficiency for marine transportation is usually modelled to provide a ratio of the amount of energy inputed by fuel against the transport work undertaken (i.e. cargo weight unit-distance travelled). However, in the design of forecasts aligned with emission pathways, models often present the CO₂ emissions from the burned fuel compared to the transport work (as the fuels under the scope come from fossil sources) (ICCT 2013). Models considering biofuels can thus report a lower indicator, thus limiting the indicator to a proxy of fuel efficiency for ambitious scenarios. The IEA publishes the total emissions for their 4DS and 2DS scenarios, but as the shipping demand is not disclosed, it is not possible to use their data to build this indicator.

Method ACT. Projections are based on UMAS' scenario 8. This scenario models energy efficiency from technical and operational improvements. The scenario also models efficiency by type of ship. Size and age are not detailed, as they combine these characteristics into factors to calculate the annual shipping activity per year. The scenario assumes: i.) An allowance for purchasing carbon offsets for an up to 20% of the revenue derived from carbon pricing. This MBM starts in 2025; ii.) a 20% of slow steaming is allowed.

Method LCT. Projections for the LCT are based on UMAS' scenario 10. The scenario assumes: i.) An allowance for purchasing carbon offsets for an up to 80% of the revenue derived from carbon pricing, resulting in a lower rate of improvement in energy efficiency. This MBM starts in 2025; ii.) a 1% of slow steaming is allowed. An alternative to this scenario could be the EDDI+ scenario developed in ICCT 2013.

Results. The ACT sees the maximum reduction in fuel consumption for the dry-bulk segment with an average sector abatement of 52% by 2040 from 2010 levels. The lowest abatement comes from the container segment with 26% reduction. In the LCT, the highest improvement in fuel consumption comes as well from the dry-bulk segment with 40% decrease and the lowest from the container segment with a 18% decrease by 2040. Under the LCT, the container segment is projected to have a rebound effect after 2035 as the increase of biofuels allows to operate at higher speeds with a reduced impact in the carbon emissions. This effect is also present in the ACT scenario at a lower scale.

TABLE. 7.2 FUEL EFFICIENCY (MJ/TONNE-KM) PROJECTIONS IN THE ACT AND LCT SCENARIOS (SOURCE: AUTHORS, BASED ON UMAS 2016)

Year	Dry-bulk		Container		Gas		Gen. cargo		Wet Prod. Chem.		Wet crude	
	ACT	LCT	ACT	LCT	ACT	LCT	ACT	LCT	ACT	LCT	ACT	LCT
2010	5.0	5.0	85.5	85.5	15.9	15.9	7.1	7.1	12.1	12.1	14.0	14.0
2015	3.9	3.9	67.4	63.8	14.5	14.5	7.1	7.1	12.1	12.2	16.1	16.1
2020	3.5	3.5	70.3	65.4	13.6	13.2	6.8	6.5	11.1	10.6	15.3	14.9
2025	3.2	3.2	68.0	61.8	12.3	11.8	6.3	6.0	9.9	9.4	13.3	12.4
2030	2.8	3.0	65.7	62.3	10.8	11.1	5.6	5.7	9.2	8.9	11.7	11.7
2035	2.5	2.9	62.7	62.1	9.1	10.7	4.5	5.4	7.5	8.4	9.9	10.7
2040	2.4	3.0	63.6	70.2	8.1	10.9	4.0	5.4	6.5	8.1	8.3	9.7

7.3 ALTERNATIVE FUEL PENETRATION



Overview. Three types of fuels are expected to increase in uptake in the transition to a low carbon economy: LNG and biofuels from 2020, and hydrogen from 2030. Alternative fuels will arise as a cost-efficient option to comply with regulations (i.e. air pollutant emissions control (i.e. NO_x, SO_x) regulations (LNG) and the CO₂ limits), competing with the usage of traditional fuels (i.e. HFOM MDO) with installation of abatement technologies for emissions reduction (McGill et al. 2013).

Risk pass-through mechanism. The switch to alternative fuels can affect companies' margins and revenues in two ways: increased capital costs and operational expenses. Shipowners may incur in higher capital expenditures to retrofit the infrastructure for adopting alternative fuels. It is uncertain how the costs pass through could impact the tariffs of voyager and time contracts as tariffs respond mainly to market forces. Operational expenses are mainly related to purchase of alternative fuels (see next page).

Sources. Forecasts for fuel mix are generally built around the actual and projected regulations that will directly affect fuel use in the sector, alongside with assumptions on technological development and adoption of potential alternative fuels. For instance, several reports consider penetration of LNG as a measure to comply with the projected new Sulphur limit restrictions (e.g. Kent, et al. 2013, McGill, et al. 2013). Fuel Marine Trends 2030 considers the presence of LNG and introduces hydrogen as a decarbonisation option in their most optimistic scenario by 2030, while IEA considers LNG and biofuels (ETP 2016) for their 2DS and 4DS. UMAS 2016 foresees a higher penetration of hydrogen after 2030. Some other scenarios only breakdown the fuel mix between biofuels and conventional fuels but provide no visibility on the type of fuels considered (e.g. Greenpeace 2016).

Method. The fuel shares presented here follow UMAS 8 (i.e. ACT) and 10 (i.e. LCT) scenarios. The ACT scenario assumes a significant uptake of biofuels and hydrogen as a measure for the decarbonisation of the sector. The LCT scenario assumes an ambitious penetration of biofuels, limited LNG and hydrogen uptake in the fuel mix. Alternatively, users can compute the alternative fuels share using the energy fuel data provided in IEA ETP 2DS and 4DS. In doing so, inconsistencies with other indicators need to be considered.

Results. Table 7.3 provides the fuel mix under an Ambitious Climate Transition and Limited Climate Transition scenario. In the ACT scenario, technological advancements and bio-availability allow the penetration of biofuels starting in 2020 and reaching a share of 20% by 2040. Hydrogen will be used starting in 2030 occupying a share of 6% by 2040 in the ACT and less than 1% in the LCT. Biofuels in the LCT will account for 48% of the total supply by 2040.

TABLE 7.3 FUEL MIX UNDER THE ACT AND LCT SCENARIO (SOURCE: AUTHORS, BASED ON UMAS 2016)

Year	HFO/LSHFO		MDO/MGO		LNG		HYDROGEN		Biofuels	
	ACT	LCT	ACT	LCT	ACT	LCT	ACT	LCT	ACT	LCT
2010	93%	94%	4%	5%	2%	2%	0%	0%	0%	0%
2015	82%	82%	17%	18%	0%	1%	0%	0%	0%	0%
2020	76%	69%	18%	15%	0%	0%	0%	0%	7%	15%
2025	70%	58%	18%	14%	3%	0%	0%	0%	9%	28%
2030	64%	48%	19%	12%	3%	0%	1%	1%	14%	38%
2035	58%	44%	19%	10%	4%	1%	2%	1%	17%	45%
2040	50%	44%	17%	8%	8%	1%	6%	1%	20%	48%

7.4 MARINE FUEL PRICES



Overview. Heavy Fuel Oil (HFO) and Marine Diesel (MDO) are the most used fuels in the sector. These are oil-derived fuels; thus, its price is highly correlated with oil-prices. On the other hand, LNG naturally follows the gas price, however, its modelling should include an adjustment factor to contemplate necessary capital investment in the infrastructure required. Hydrogen and methanol can be also modelled following a similar process to that of LNG price estimation or using generate equilibrium models considering different assumptions around oil price projections and decarbonisation pathways (e.g. UMAS 2016b).

Risk pass-through mechanism. As in any other sector, changes in marine fuel prices will have a direct effect on operational expenses for the energy cost payer (i.e. the ship owner under a voyager charter contract or the end-user under a time charter contract). Opting for one type of fuel or another will require a cost-benefit analysis that considers the costs of adopting technologies for emission reduction and the decrease in costs associated to the purchase of less CO₂ emissions allowances.

Sources. In general, scenarios that cover multiple sectors do not disclose their assumptions/forecasts around marine fuel prices. Scenarios modelling exclusively the sector tend to give more visibility on market prices (e.g. GMFT and UMAS).

Method ACT. The prices under the ACT scenario are taken from the “2 degree prices scenario” of UMAS 2016. The scenario assumes that LSHFO (Low Sulphur Heavy Fuel Oil) enters the market by 2020 with a price linked to the MDO price by a factor of 1.28.

Method LCT: Prices for the LCT scenario are based on the estimates of GMFT 2013. The Global Commons model of GMFT considers a scenario with more climate action than a BAU scenario and is less ambitious than a 2°C scenario. Global Commons Scenario demand estimates are similar to those of the LCT demand (see Page 72). The model is limited to 2030 and its indexed to HFO prices.

Results. Figure 7.4 and 7.5 present the results under the ACT and LCT scenarios. Fossil fuel derivatives prices are projected to continue increasing at a constant rate. Marine Gas Oil (MGO) is projected to be the highest price option in both scenarios. In the LCT, the expected increase in its price is 30% by 2030 respect to 2015 levels. HFO will remain as the lowest cost option, but from 2020, its use alongside with emission abatement technologies will be required to comply with emissions regulation.

TABLE. 7.4 MARINE FUEL PRICES UNDER ACT IN (USD/GJ) (SOURCE: AUTHORS, BASED ON UMAS 2016)

Year	HFO	LSHFO	MDO	LNG	Hydrogen
2015	11	-	15	7	-
2020	8	10	12	7	14
2025	9	10	13	9	12
2030	10	11	14	10	12
2035	9	12	15	11	11
2040	7	13	16	12	11

TABLE. 7.5 MARINE FUEL PRICES UNDER LCT, INDEXED TO 2010 HFO PRICE (SOURCE: AUTHORS, BASED ON MFT 2030 2013)

Year	HFO	LSHFO	MDO	LNG	Hydrogen
2010	1.0	1.5	1.5	1.5	2.9
2015	1.4	1.6	2.2	2.3	4.0
2020	1.4	1.6	2.3	2.0	3.6
2025	1.4	1.6	2.5	2.0	3.6
2030	1.5	1.7	2.6	2.0	3.7

7.5 EFFICIENCY STANDARDS – EEDI



Overview. The Energy Efficiency Design Index (EEDI) is a standard adopted in 2011 by the International Maritime Organization (IMO). EEDI sets the mandatory minimum technical efficiency levels per transport work (ton-km) for new ships. Compliance is demonstrated by the issuance of an International Energy Efficiency Certificate (IEEC). Many new build ships are currently outperforming EEDI requirements even compared to future stages of the standard. The implementation of the IMO Roadmap (IMO 2016) will most likely contribute to the increase of the standard's requirements.

Risk pass-through mechanism. Companies non-compliant with EEDI could be exposed to regulatory risks as port state control mechanisms requiring compliance with the standard “under their flag” (i.e. ships registered in the country) may deny the entry of non-compliant ships.

Sources. Few organisations have developed projections of the effects of EEDI in the global fleet, and have challenged its current stipulations as non-aligned with market forces and with a decarbonisation pathway (e.g. ICCT 2013, UMAS 2016). ICCT modelled the effects of EEDI in the reduction of global emissions along with more ambitious scenarios. UMAS 2016 modelled decarbonisation scenarios, along with a BAU with EEDI scenario, concluding that its requirements are outdated policy, as the current EEDI projection could only reduce 3% of the emissions of a non-EEDI world by 2050 (UMAS 2016).

Method. UMAS scenarios are preferred as they modelled how the EEDI index for several ship types will evolve under their decarbonisation scenarios, including a reference scenario of the current policy results.

Results. EEDI compliance at the current values is not sufficient to be aligned in with the ACT nor the LCT. Additional carbon intensity reduction mechanisms are needed (i.e. technical measures, alternative fuels, carbon offsets).

TABLE 7.5 REQUIRED EEDI REDUCTION FACTORS BY SHIP CAPACITY (SOURCE: AUTHORS, BASED ON UMAS 2016)

Type of ship	Size	Phase 0	Phase 1	Phase 2	Phase 3
		1 Jan 2013 - 31 Dec 2014	1 Jan 2015 - 31 Dec 2019	1 Jan 2020 - 31 Dec 2024	1 Jan 2025 - onwards
Bulk Carriers	>20 000 DWT	0%	10%	20%	30%
	10-20 000 DWT	n/a	0-10%*	0-20%*	0-30%*
Gas tankers	>10 000 DWT	0%	10%	20%	30%
	2-10 000 DWT	n/a	0-10%*	0-20%*	0-30%*
Tanker and combination carriers	>20 000 DWT	0%	10%	20%	30%
	4-20 000 DWT	n/a	0-10%*	0-20%*	0-30%*
Container Ships	>15 000 DWT	0%	10%	15%	30%
	10-15 000 DWT	n/a	0-10%*	0-15%*	0-30%*
Refrigerated cargo carriers	>5 000 DWT	0%	10%	15%	30%
	3-5 000 DWT	n/a	0-10%*	0-15%*	0-30%*

*The reduction factor is to be linearly interpolated between the two size values depending on the vessel size. The lower value of the reduction factor

7.6 EFFICIENCY STANDARDS - GHG RATING



Overview. The GHG Emissions Rating (ER) index allows to classify the CO₂ emissions by ship and benchmark performance of vessels with similar characteristics. Calculations are based on the EEDI standard and on the EVDI index. The EVDI index is the equivalent of EEDI but for in-use ships. After the EDVI/EEDI is calculated a formula is applied to obtain a score that allows to assign a GHG ER through peer comparison (Fig. 7.1).

Risk pass-through mechanism. Noncompliance with the minimum levels of the GHG ER could potentially represent revenue losses for shipowners. Charterers, covering over 20% of the global maritime fleet, have started using the rating to create policies in order to exclude lower performing vessels (i.e. F and G levels in Fig 7.1). Some ports have started programs to offer discounted harbour dues based on environmental metrics, such as the GHG Index rating (RightShip, 2017). Charter rates can increase in the long-term as shipowners invest in improving their GHG rating. In the long run, this can be beneficial for ship-owners under a voyage contract and companies under a time charterer contract as they perceive a reduction in fuel costs due to fuel savings.

Sources. Few papers discuss the impact of the GHG ER. A study that aims to assess the impact that the GHG rating has in the energy efficiency of the fleet and the implications for different stakeholders (i.e. charterers, shipowners and operators, financiers and policymakers) was published recently by UCL Energy Institute (UCL 2016). The study concludes that policymakers could benefit from the transparency provided by the index to support the sector’s energy efficiency and decarbonisation.

Method. Due to the novelty of the research on the GHG Emissions Rating and its lack of implementation as a policy tool, the analysis of the standard is limited to a description of the current’s fleet performance.

Results. Figure 7.2 presents an overview of the current GHG ER index performance of the four main ship categories for the top 30 shipping companies. Container is the leading segment with a higher share of A-class ships (approx. 4%), however, 76% of the fleet is classified as D-and-worse, showing that industry’s leading performers have a bigger gap to fill compare to other segment’s fleet. The tanker sector has the biggest share of A and B class, with 18% of the fleet allocated in these categories.

FIGURE 7.1 GHG EMISSIONS RATING KEY – NORMAL PEER DISTRIBUTION (SOURCE: AUTHORS, BASED ON RIGHTSHIP 2017)

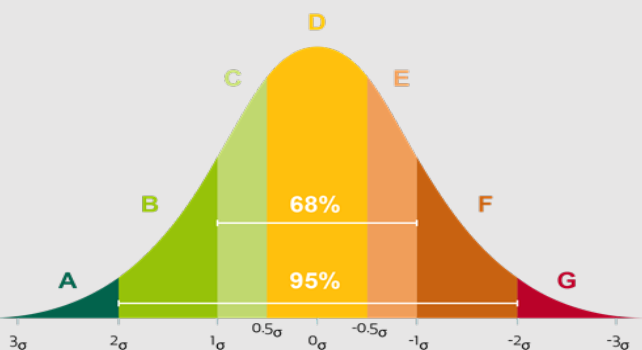
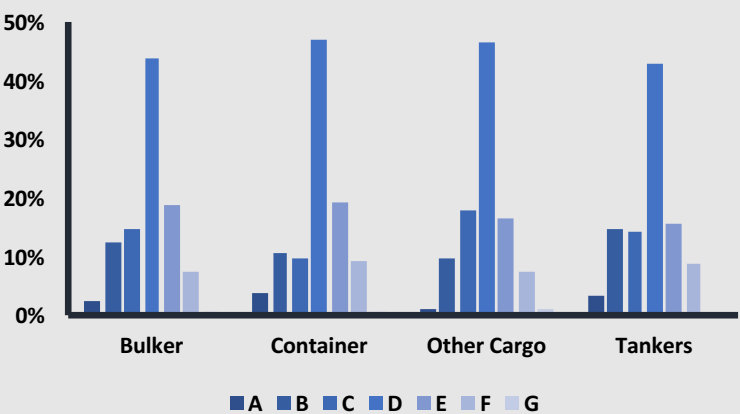


FIGURE 7.2 GHG INDEX BY TYPE OF SHIP (SOURCE: AUTHORS, BASED ON RIGHTSHIP DATA)





MEET THE BUILDERS - ET RISK CONSORTIUM

The ET Risk consortium, funded by the European Commission, is working to develop the key analytical building blocks (Fig. 0.1) needed for Energy Transition risk assessment and bring them to market over the coming two years.



1. TRANSITION SCENARIOS

The consortium will develop and publicly release two transition risk scenarios, the first representing a 'soft' transition extending current and planned policies and technological trends (e.g. an IEA NPS trajectory), and the second representing an ambitious scenario that expands on the data from the IEA 450S /2DS, the project's asset level data work (see Number 2), and relevant third-party literature. The project will also explore more accelerated decarbonization scenarios.

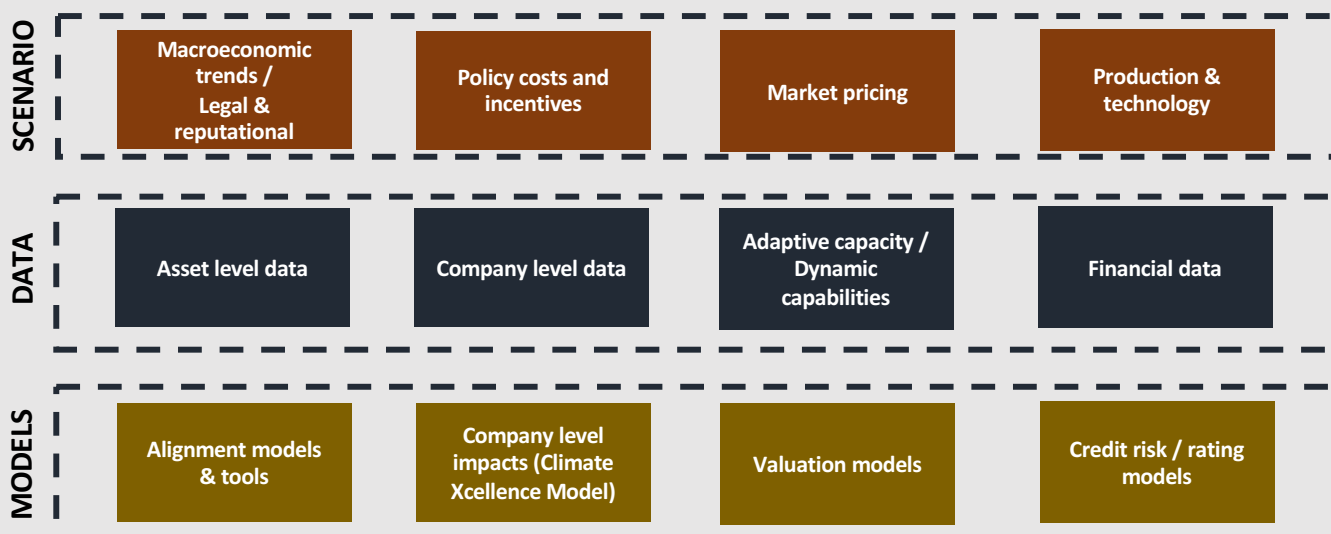
2. COMPANY & FINANCIAL DATA

Oxford Smith School and 2° Investing Initiative will jointly consolidate and analyze asset level information across six energy-relevant sectors (power, automotive, steel, cement, aircraft, shipping), including an assessment of committed emissions and the ability to potentially 'unlock' such emissions (e.g. reducing load factors).

3. VALUATION AND RISK MODELS

- a) **2°C portfolio assessment – 2° Investing Initiative.** 2° Investing Initiative will seek to integrate the project results into their 2°C alignment model and portfolio tool and analytics developed as part of the SEI metrics project.
- b) **ClimateXcellence Model – The CO-Firm.** This company risk model comprises detailed modeling steps to assess how risk factors impact margins and capital expenditure viability at the company level.
- c) **Valuation models – Kepler Cheuvreux.** The above impact on climate- and energy-related changes to company margins and cash flows can be used to feed discounted cash flow and other valuation models of financial analysts. Kepler Cheuvreux will pilot this application as part of their equity research.
- d) **Credit risk rating models – S&P Global.** The results of the project will be used by S&P Global to determine if there is a material impact on a company's creditworthiness. S&P Dow Jones Indices, a S&P Global Division, will explore the potential for developing indices integrating transition risk.

FIG. 0.0: ASSESSING TRANSITION RISK ACROSS THE INVESTMENT CHAIN (SOURCE: AUTHORS)





ABOUT 2° INVESTING INITIATIVE

The 2° Investing Initiative [2° ii] is a multi-stakeholder think tank working to align the financial sector with 2° C climate goals. Our research work seeks to align investment processes of financial institutions with climate goals; develop the metrics and tools to measure the climate friendliness of financial institutions; and mobilize regulatory and policy incentives to shift capital to energy transition financing. The association was founded in 2012 and has offices in Paris, London, Berlin, and New York City.

ABOUT THE CO-FIRM

The CO-Firm GmbH is a boutique consultancy specialized in developing climate and energy strategies for financial services providers, industry, and utilities. Based on financial risk modelling under a range of climate and energy scenarios, the proprietary ClimateXcellence Toolset, and a dataset of more than 200.000 assets and more than 15.000 different technical mitigation measures, The CO-Firm supports its clients in identifying, evaluating and realizing their specific economic opportunities in the national and global climate transition. Specifically, the CO-Firm serves its clients in adjusting their strategies, setting Science Based Targets, creating new business models, and identifying cost savings in their operations and their supply chain. Additionally, the consultancy provides regulatory monitoring services.

Authors: Laura Ramirez*, Jakob Thomä***, Jean-Christian Brunke**, Nicole Röttmer**, Marco Duran*, Chris Weber*, Stan Dupré*, Martin Granzow**, Mark Fulton (Advisor)

* 2° Investing Initiative

** The CO-Firm

*** 2° Investing Initiative, ADEME, Conservatoire National des Arts et Métiers

Contact:

Email: contact@2degrees-investing.org

Website: www.2degrees-investing.org

Telephone: +33 1 4281 1997 • +1 516 418 3156

Paris (France): 97 rue la Fayette, 75010 Paris, France

New York (United States): 205 E 42nd Street, 10017
NY, USA

London (United Kingdom): 40 Bermondsey Street,
SE1 3UD London, UK

Berlin (Germany): Am Kupfergraben 6a, 10117
Berlin, Germany



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 696004.

The views expressed in this report are the sole responsibility of the authors and do not necessarily reflect those of the sponsor, the ET Risk consortium members, nor those of the review committee members. The authors are solely responsible for any errors.