STRANDED ASSETS AND THE SHIPPING INDUSTRY

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ABSTRACT

According to IMO forecasts, CO_2 emissions from world shipping could double by the year 2050. Although shipping is in most cases the most efficient mode of transport per unit of transport supply, it is still heavily reliant on heavy fuel oil to power its propulsion. The IMO has introduced regulations to bring about reductions in the emissions of ships, including an Energy Efficiency Design Index which sets a mandatory CO_2 intensity reduction target for new ships and imposing a sulphur regulation on ships operating in certain sea areas. At the same time, charterers are beginning to factor energy efficiency into their commercial decision-making through use of the EVDI (an approximation of EEDI). Exemplifying this trend, Cargill, Huntsman and UNIPEC UK publically announced in October 2012 that they would no longer charter the least efficient ships in the fleet. This regulatory environment, along with the uncertainty in energy prices and increased awareness of the industry's carbon footprint, poses a threat to existing ships' profitability and may result in certain ships becoming stranded assets. The objective of this paper is to identify the supply and demand-side risk factors contributing to existing ships becoming stranded assets, and to frame how an assessment could be carried out on the risk of stranded assets in the shipping industry.

Keywords: shipping, stranded assets, GHG, regulation, markets, CO_2

1. INTRODUCTION – WHAT IS A SHIPPING STRANDED ASSET?

A stranded asset is defined as "an asset which loses economic value well ahead of its anticipated useful life" (Saltzman, 2013). This unanticipated devaluation can be caused by a range of risk factors, including changes in legislation, market forces, environmental challenges, social norms and consumer behaviour.

Most recent discussion has focused on the issue of stranded carbon assets, where the risks of climate change and the resulting mitigation and adaptation widely understood to be required, will lead to the devaluation of that asset. This is usually due to the carbon intensity of those assets i.e. they emit large quantities of CO2, or they rely on fossil fuels for their operation. It is argued that stranded carbon assets are likely to become widespread, especially as it is claimed that environment-related risks are "poorly understood and regularly mispriced, which has resulted in a significant over-exposure to environmentally unsustainable assets throughout our financial and economic systems" (Smith School, 2014).

This initial work has led to thinking about whether there could be other classes or types of assets that could be classified similarly. The key assets of the shipping industry, the vessels themselves, are primarily driven by fossil fuels, therefore they are generally large emitters of CO_2 and in some sectors they rely on the fossil fuel industry for a large proportion of their trade e.g. oil tankers. Under current policy, the IMO has estimated an evolution of the world fleet that would result in a range of future CO_2 emissions scenarios, presented in Figure 1 as the 3rd IMO GHG scenarios (Smith et al., 2014). The future scenarios can be contrasted with the expected trend in overall emissions, consistent with a stabilisation of temperature to 2 degrees by 2100. The contrast between the expected growth in emissions and the pathway that is required as an average across the whole economy suggests that there is imminent need for further regulation of shipping CO_2 emissions, and this in turn implies that the shipping industry, just like other sectors, may experience stranded carbon assets in the future.

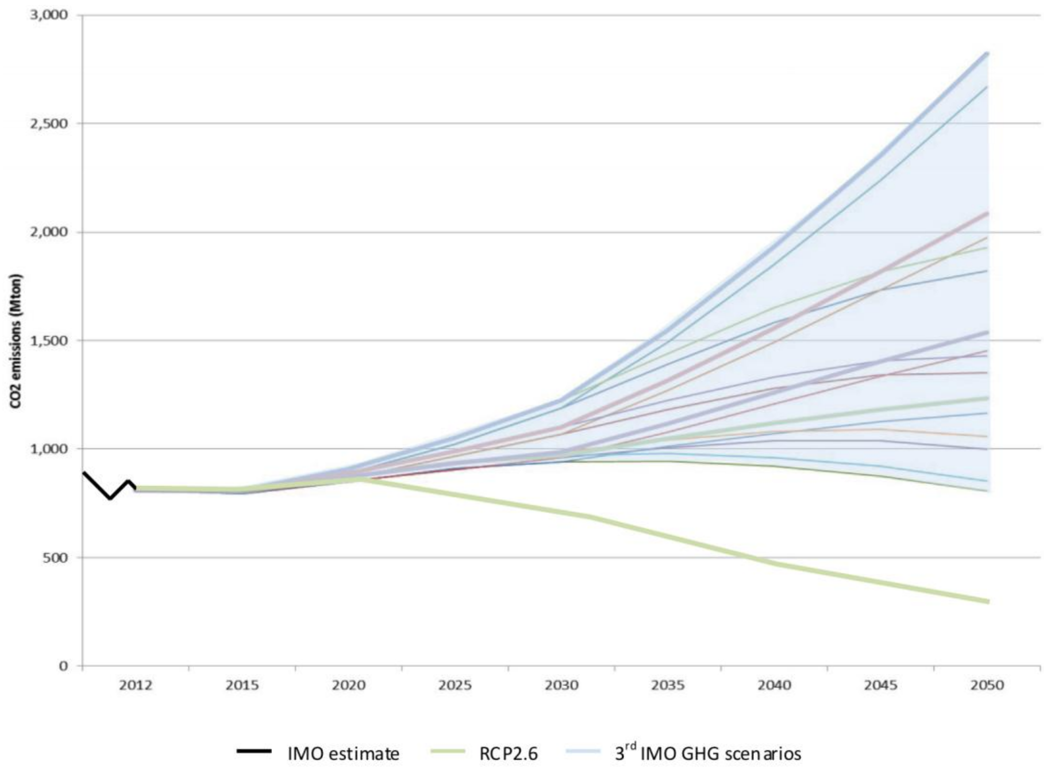

Figure 1: CO_2 emissions trajectories for shipping, contrasted with a 2 degrees pathway from IPCC AR5 (RCP 2.6)

In addition to climate change mitigation related impacts, other environmental challenges, and the global response to those challenges, may lead to the stranding of shipping assets. For example, the impending Entry into Force of the IMO's Ballast Water Management Convention may result in the stranding of some existing vessels where the cost of retrofitting treatment systems makes the continued use of the vessel economically unviable.

The purpose of this study is to determine the key demand and supply side risks leading to the causation of a stranded asset in shipping terms, and to develop methods that could be used to asses these risks.

2. POSSIBLE STRANDING RISKS FOR SHIPPING

Possible stranding risks are divided into two categories:

- supply –side stranding risks: risks associated with the ship's specification
- demand-side stranding risks: risks associated with the demand for ships of a certain specification

2.1 SUPPLY-SIDE STRANDING RISKS

2.1 (a) Regulation

In 2011, the IMO's Marine Environment Protection Committee (MEPC) adopted measures which add a new chapter to MARPOL Annex VI entitled "Regulations on energy efficiency for ships", making mandatory the Energy Efficiency Design Index (EEDI) for new ships and the Ship Energy Efficiency Plan (SEEMP) for all ships. The regulations entered into force through the tacit acceptance procedure on 1 January 2013 and apply to all ships over 400 gross tonnage and above. The EEDI regulation requires newbuild ships to meet minimum carbon intensities that then reduce over time, which is likely to force some rate of change on the industry. However, as illustrated in Figure 1's future scenarios (which all include the effects of the EEDI regulation), it is expected that further regulation will be necessary. Figure 2 represents two potential bounding pathways for the fleet average carbon intensity. Both pathway show reducing carbon intensities with the 2 degree pathway showing high rates of change. Both pathways show that significant changes to fleet average carbon intensity can be expected over the course of a ship's life. Given that a ship's carbon intensity is closely related to its energy efficiency (at least under conventional fuels), these changes could have implications for the market that a ship is operating in, and the competitiveness and earnings of a ship over time.

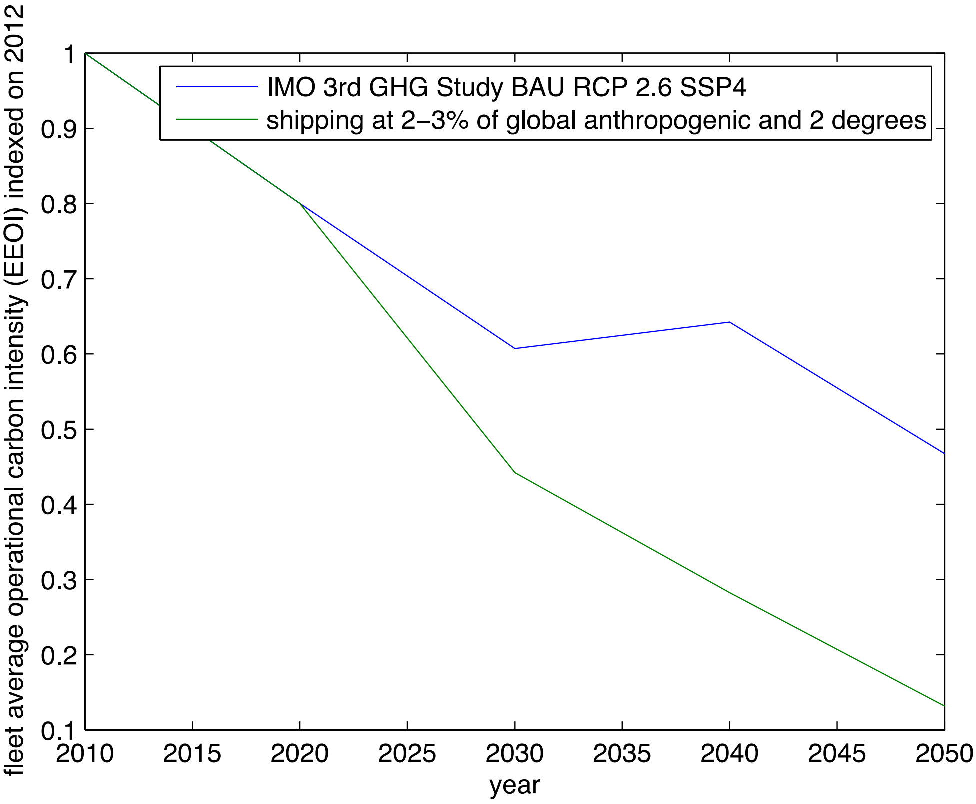

Figure 2: Scenarios for future fleet average carbon intensities, both as expected under current policy (BAU RCP 2.6 SSP4) and a more stringent scenario that would be consistent with international shipping maintaining its current share of anthropogenic CO2 under a 2 degree pathway.

2.1 (b) Sulphur switch

In addition to carbon related legislation, the shipping industry also faces other regulatory developments. Many ports in the US and Europe are already within ECA (Emission Control Areas) that require ships to switch to fuel that contains 0.1% sulphur or less when in port or nearby waters. Recently Hong Kong became the first city in Asia to legislate on this issue. As the fourth busiest container port in the world, and where half of air pollution is reported to be produced by marine vessels, vessels are required to use low-sulphur diesel in the Pearl River Delta ports. And in either 2020 or 2025, the global cap of 0.5% sulphur will enter into force, requiring either fuel switching, or the fitting of sulphur treatment equipment (scrubbers). The choices made by shipowners may affect the competitiveness of an asset and may also heighten the valuation impact of any energy efficiency differentiation between ships.

2.1 (c) Ballast Water

In February 2004, the IMO adopted the International Convention for the Control and Management of Ships' Ballast Water and Sediments (the Ballast Water Management or BWM Convention) to regulate discharges of ballast water and reduce the risk of introducing non-native species from ships' ballast water. To complement the BWM Convention, the IMO adopted over 15 sets of guidelines and other documents contained in its Marine Environmental Protection Committee (MEPC) resolutions and circulars. This Convention will Enter into Force 12 months after ratification by the qualifying number of states. When it does, all ships will be required to manage their ballast water on every voyage by either exchanging or treating it using an approved ballast water treatment system. It is estimated that more than 50,000 ships will have to be retrofitted with BWM systems at potentially very high cost to shipowners due to additional power requirements and the need for pipe re-dimensioning. Purchase and installation of BWM systems are currently estimated to involve costs ranging from USD 50,000 to above USD 5 million per ship. (BIMCO, 2015).

2.2 DEMAND-SIDE STRANDING RISKS

2.2 (a) Regulation- terrestrial

Emerging terrestrial (as opposed to marine-related) regulation is also likely to affect the shipping industry, and potentially result in stranded assets in the shipping world. European environmental legislation is not new, and the EU Emissions Trading Scheme (ETS) is a key tool in reducing industrial greenhouse gas emissions. However, other parts of the developing world are now implementing new legislation designed to tackle climate change, and the knock-on effects on both inefficient vessels and vessels shipping fossil fuels could be substantial. For example, China has implemented environmental standards for coal power producers that are just as stringent as European standards (Standard Life Investments, 2014). In 2014 China rolled out its Air Pollution Action Plan, aimed at tackling the country's long-existing air pollution problem. In addition, in 2014, Chile became the first South American country to tax carbon, with the power sector the main target off the new legislation. Mexico has already imposed a tax on the sale of several fossil fuels based on their carbon content. To some extent such risks have already been envisioned in future transport demand scenarios. In the Third IMO GHG Study (Smith et al. 2014), demand scenarios were derived according to different ship types. For ship types that transport energy commodities, the demand scenarios included the anticipated change in energy commodity demand created as globally energy systems decarbonise, switching from fossil fuel use to renewables and nuclear power. Figure 3 demonstrates the consequence of this change in demand to the three major ship types, two of which have a significant role in transporting energy commodities: oil tankers and dry bulk carriers. The oil tanker future demand scenario is gradually reducing whereas dry bulk carriers have an increasing transport demand – driven by the increase in demand for non-energy dry bulk commodities.

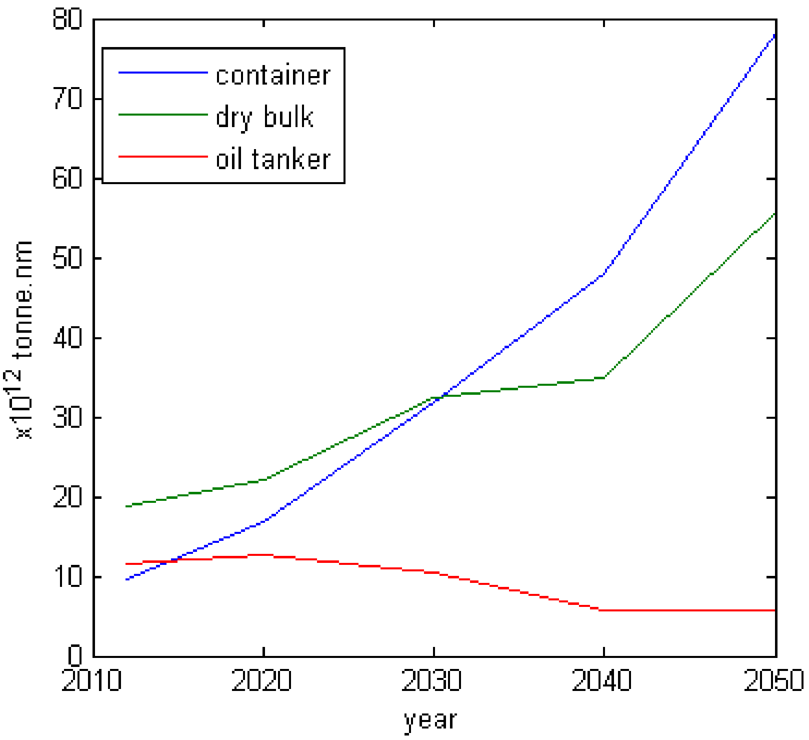

Figure 3: Transport demand scenarios for the three major ship types under the RCP 2.6 SSP4 scenario (approximately consistent with 2 degrees), as estimated in the Third IMO GHG Study 2014.

2.2 (b) Public pressure

The demand for cleaner ships is growing (Carbon War Room, 2011). Pressure from both ports and communities that live near ports and busy shipping lanes for reduced emissions to air is increasing. In addition, consumers are becoming increasingly knowledgeable about the sustainability impact of the products they buy. This also translates to the shipping supply chain with several initiatives in place to allow customers to make business decisions based on environmental and sustainability performance of vessels. For example, the Clean Shipping Index (CSI) provides a tool for shippers and logistic service providers to measure and increase the level of sustainability of ocean carriers. High profile shippers such as Volkswagen and H&M use the service. As a result of participating in the scheme, vessels are given a score in relation to performance in terms of CO_2 emissions, NO_X emissions, SO_X emissions, Chemical Products, Water and Waste. Financial incentives exist for being a high scorer under this scheme, as the score that a vessel receives can translate into significant savings at various participating ports. For example, the Prince Rupert Port Authority offers reduced Harbour dues to vessels that score highly under CSI.

2.2 (c) Divestment campaigns

Raised awareness of environmental issues and public pressure to divest away from fossil fuels is on the rise. The 350.org campaign is a climate movement that began in the US in 2012 and calls on asset owners to divest away from fossil fuel related investments. The 350.org website claims that 181 institutions and local governments, as well as 700 individuals have pledged to divest from fossil fuels, representing over $50 billion USD in assets.

3. THE CURRENT EVIDENCE FOR THE CONSIDERATION OF STRANDED ASSETS

In conventional shipping segments, ship assets regularly suffer downward revaluations and premature write offs due to the nature of the shipping markets: Firstly, the shipping market is a community, and ship assets are commoditised, subject to the same trading fads and fashions as any other commodity community, like the oil market, rather than a mechanical system governed by the laws of physics. Secondly, the long term lead time on vessel supply (vessel building and scrapping) is constantly chasing the volatilities and vagaries of commodity shipping demand, both factors leading to severe cyclicality and sentimental trends. For these reasons it is not immediately obvious how the term “stranded asset” should be applied in shipping. Illustrations of this cyclicality can be seen in Figure 4 and 5, all data is obtained from Clarksons Shipping Intelligence Network. Figure 4 shows the cyclicality of both the time charter prices (TCE) and the second hand prices, and Figure 5 demonstrates counter-cyclicality of time charter prices and the number of deliveries.

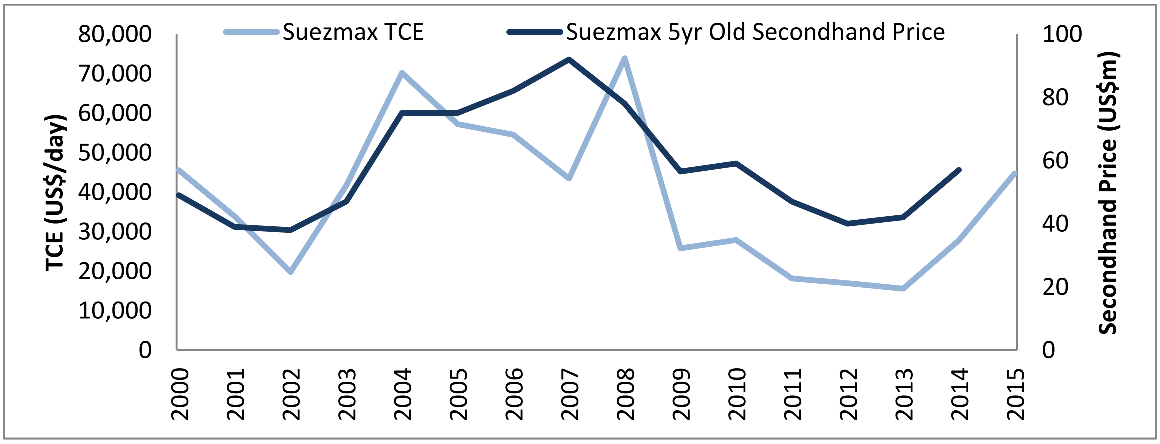

Figure 4: Suezmax time charter prices (TCE) and second hand prices, 2000-2015.

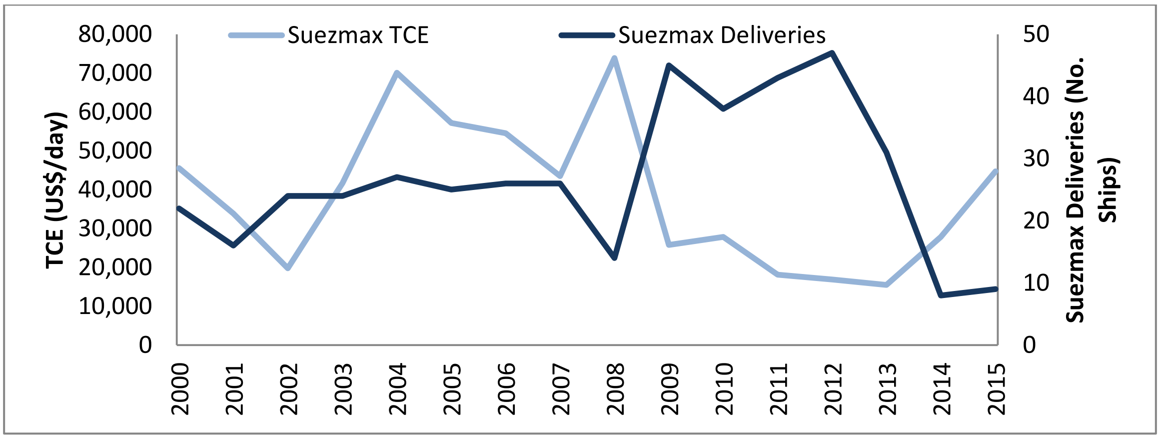

Figure 5: Suezmax time charter prices (TCE) and deliveries, 2000-2015.

The consequence of these cycles is that owners and banks will spend sustained periods in the bottom quartile of most market cycles, with ships which could be considered by some to be 'stranded', but in most cases would ride out such period with view to mid term (1 yr +) return to parity or market value appreciation. It is therefore important to address on what terms we define an asset stranded as a result of environmental risk related factors when, within one shipping cycle, it is difficult to differentiate between the economic impact of the market and environmental risks.

The suggested solution is to model intrinsic value of a vessel only, with broad 'average market' assumptions. Average intrinsic value will, in the long term filter through to affect the vessel earnings and ultimately 'market value'. An example of this can be seen when comparing recent vessels built in Japan and China. Japanese vessels are generally more reliable (spend fewer days off-hire) and have lower opex, so attract an asset value premium.

4. A POTENTIAL FRAMEWORK FOR ASSESSING WHETHER A SHIP HAS, OR WILL BECOME A STRANDED ASSET

The approach taken to answer the question of whether a ship will become a stranded asset is to compare two ships which would be operating in the same market, and consider whether over a period of the market, one of the ships is likely to produce significant losses or return lower intrinsic value. In considering intrinsic value, one should consider the size of the outcome, the temporal delay and the probability of risks to such outcome prediction.

Investors who use hyperbolic discount models (e.g. NPV) to measure intrinsic value, typically value rewards more than distant future risks. We can then introduce such distant future risks to model the potential impact and assess the possibility of stranded assets as a result.

(1) For the base case we select a vessel of average age in the segment and run a model assuming entry at today's market value (for a vessel of that average age), asset depreciation to scrap over the useful remaining life of the vessel and corresponding dnbv at exit, typically within 5 – 12 years of entry (segment dependent). We can test the model with charter rates as the principle variable, to find a rate which matches an owner's expected return (assuming 8% IRR, 65% LTV and 5% incl. Libor finance cost).

(2) We then apply the negative impact of relatively poorer consumption of these average age second hand vessels compared with an eco new building constructed with today's technology, by applying a premium to the TCE rate, equivalent to 100% of the value of the additional daily bunkers required in order to meet the same trade and achieve the same IRR. This provides simple guidance to the additional market strength required to achieve the same IRR as the eco- vessel. In this simple model, we have used an estimated average future bunker price based on crude oil at $60 bbl and bunker cost historical average of 74% of crude oil for this base model.

(3) We make a similar discount model for the new building vessel, delivering with expected fuel consumption improvements, calculating IRR in the same way as for a second hand vessel.

(4) Finally a ‘reverse calculation’ renders the input price required for the second hand vessel, in order to meet the same IRR as the new building vessel. This is achieved by applying the TCE rate of the new build vessel, required to meet 8% IRR, less the fuel saving (i.e. the TCE level the second hand vessel might achieve). The investment capex (for average age vessel) is then modified / discounted to achieve the same IRR (i.e. 8%). This offers guidance as to the new intrinsic value of the vessel at the time of initial investment, as the new ‘eco’ vessels become ’normal’ in the market. The discount between market value and the new intrinsic value provides guidance as to whether such a vessel is indeed stranded.

4.2 WORKED EXAMPLE OF A STRANDED ASSET EVALUATION

In the first instance we have considered the current Suezmax market (Crude Oil Tankers ranging from around 130,000 dwt to 165,000 dwt), and the impact of current new building efficiency improvements on the ’non eco’ fleet, based on an investment in 2015. Since 2010 there has been little ordering in this segment until the end of last year. The average age of the fleet is around 9 years as a result of significant ordering in 2006/7 and 10. The current new building order book is relatively significant and FOC savings are around 10 mt per day compared with older vessels. The fleet also trades significantly within ECA’s and potential ECA’s. We have considered a short investment period of 5 years, meaning impact of further regulation will be limited within this period.

The two test ships are a 2006 built secondhand ship and a 2014 newbuild ship, both with dwt of 150,000 tonnes. The ships are designed and built at the same yard, but the newbuild ship has a different duct, propeller and hull coating, and a derated, more efficient engine. The consequence is that the newbuild ship has approximately 15% less fuel consumption at the same reference speed (14.6 knots) and design draught.

The two different specification’s prices and estimated earnings are given in table 1 below. The required TC rate of the older less efficient ship is increased relative to the newbuild due to step 2 of the method above, and represents a premium equivalent to 100% of the value of the additional daily bunkers required.

The overall appraisal is that, given the parameters chosen to characterize the investment and the five year period considered, the older secondhand ship has a value erosion of $6.65m relative to the newbuild ship. An assessment that implies that the secondhand ship’s specification and price may mean such ships are heading in the direction of being defined as stranded assets.

Table 1: Prices and value erosion for a 2006 built suezmax tanker

Newbuild (2015 build) price USD	**65m**
5 y TC rate required for 8% IRR for newbuilld USD/day	**30,000**
2nd hand (2006 build) price USD in 2015	**46m**
5 y TC rate required to earn 8%, assuming 20y useful life USD/day	**33,500**
Value accretion/erosion of 2nd hand fleet	**-6.65m**

4.3 EXTENSION TO CONSIDER ALTERNATIVE STRANDING RISKS

The example given (the comparative value of two suezmax specifications) introduces the effects created by a change in market conditions and the development and entry into market of a new breed of ‘eco’ ships. Identifying the exact reason for the entry of these eco ships is difficult and probably relates to a combination of regulatory and market effects. On the regulatory side, the emergence of both EEDI and SEEMP may not have stipulated the design differential observed, but could have resulted in an increased awareness of the subject and quantification/measurement of energy efficiency. The period since the Global Financial Crisis saw both high fuel costs and extensive over-supply in the tanker fleet, which led to better employment and earnings for more efficient ships as well as a reduction in the rate of ordering for newbuilds. The latter led to an over-capacity in shipbuilding resulting in a need for shipyards to be more competitive and the combined market and regulatory pressures on energy efficiency led to shipyards using eco-design specifications to differentiate themselves and attract orders.

The hypothesis that this paper puts forwards is that the effects on asset values that these recent developments created is likely to be seen again as further environmental stranding risks materialize. Some of those risks are already known (e.g. regulation to cap sulphur emissions), its simply a question of exactly when the risk will materialize and exactly how it will affect asset values. Others, for example the possibility of further regulation on shipping's carbon intensity, are less well known. However, it should be possible to extrapolate from case studies such as the suezmax tanker example given here, to produce estimates of the extent and severity of stranding of different assets in a number of different future scenarios for the shipping industry.

It is important to consider that the required IRR and difference between current second hand and newbuild market values will have a significant effect on whether an asset is deemed stranded. In the case considered here, all parameters were considered to be deterministic. So further considerations should include the treatment of these parameters as sensitivity or robustness parameters.

5. CONCLUDING REMARKS

This paper identifies a number of stranding risks that could affect shipping asset values in the future, causing losses in economic value well ahead of its anticipated useful life. These risks were categorised into both supply-side and demand-side risks and their existence suggests that, as has been seen in other sectors, the term 'stranded asset' is appropriate for use in the context of risks for the shipping industry. Furthermore, a case study was applied to the case of a suezmax tanker and identified that significant asset valuation differential could be seen when a similar framing was applied to the appraisal of two investments opportunities: a newbuild 'eco' ship and a second hand 2006 built ship. The secondhand ship saw a value erosion over the 5 years period (estimated at $6.65m). The concept of a stranded asset risk in shipping has been differentiated from the conventional economic risks that are observed in shipping, and are created by the cyclicality and variability of the markets within which shipping assets operate.

A first framing has been proposed for how the value of a shipping asset could be assessed, and whilst it has been applied so far only to test the relative value of two assets differentiated by their energy efficiency, it is proposed that this framing could be extended for use in considering general environmental stranding risks. Further work is needed to test and demonstrate this, as well as to populate and evidence the assumptions in the model about the way differentials in energy efficiency affect earnings. The work can then be further extended by the application of the model to explore future scenarios of the shipping industry, particularly in relation to different low carbon transitions for the sector (entailing different rates of change of fleet average carbon intensity and efficiency).

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