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Ninety Percent of Everything? Recalibrating the Environmental Impact of Shipping, between 'Too Big to Fail' and 'Too Small to Matter'

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Non-Technical Summary: Two common myths shape thinking about shipping and oceans. First, ships transport nearly everything we consume. Second, we live on planet ocean, not planet earth. Although each claim is, in one sense, correct, each is also misleading. Ships transport 80-90% of international trade (by weight), they transport only 10.8% of the economy's material footprint. Although the ocean covers 71% of the planet's surface, it makes up only 0.12% of its volume. This article queries these widely accepted numbers. Not to 'correct' them but to highlight the need to question the common myths that all too often guide environmental intervention.

Technical Summary: Ships transport 90% of everything. The planet is 71% ocean. Environmentalists reference these statistics when they advocate 'buying local' to reduce shipping's environmental footprint. The shipping industry references them to argue that the industry is 'too big to fail' and therefore should

not be overly burdened by environmental regulations; furthermore, shipping's emissions are said to be 'too small to matter', considering the role the industry plays in enabling globalised consumer capitalism. Yet, this article shows that ships transport only about 10.8% of everything (by material footprint) and the planet is only 0.12% ocean (by volume). This suggests that we should employ the 90% and 71% figures with caution. Evidence demonstrates that environmental policy derived from crude quantification of an industry's significance can have unintended, and at times unwanted, consequences for the world's economy and, crucially, the planet's environment. Although we do not question the global significance of either the ocean or maritime transport, we argue that for appeals to size and scale to be useful in generating ocean consciousness and guiding policy interventions they need to be questioned every time they are invoked.

Social Media Summary: Ships transport 80-90% of international trade, but only 11% of the economy's material footprint. This wide gap urges us to rethink common myths about the economy and the environment.

Keywords: maritime transport; logistics; economies of scale; political ecology; ocean geography; quantification

Introduction

Shipping has long presented a conundrum for economists and environmentalists. Relegated to the category of a derived demand (something that happens logically subsequent to the key economic activities of production and consumption) in a space that is external to the fundamental regulatory world of state territories, shipping and the ocean within which it occurs has all too often been an afterthought when it has been considered at all (Campling & Colás, 2021; Steinberg, 2001). More recently, inspired by the crucial role of global trade in the world economy ('globalisation'), including, especially, ocean-going trade, as well as by the role of oceanic processes in generating and exhibiting the impacts of climate change, the ocean and the shipping that occurs therein has become a focus for environmental intervention (e.g. Bows-Larkin et al., 2015).

In short, shipping, once thought of as 'small' and ancillary, is now seen as 'big' and foundational, and this has elevated the position of the shipping sector, and the ocean more broadly, as a potential focal point for environmental intervention. Similarly, maritime transport (and notably container ships) often serves as a shorthand for trade (e.g. "West coast ports brace for China tariffs to dent import volume within days," 2025). As we discuss in this intelligence briefing, however, this 'bigging up' of the ocean is itself problematic, partly for empirical reasons (depending on one's measure, shipping, and the ocean, can actually be seen as quite small) and partly for programmatic reasons (the policy implications of 'bigness' are not straightforward). Therefore, we conclude by suggesting that if one is to consider shipping as a pressure point for climate policy, rather than thinking of shipping (and the ocean) as either 'big' or 'small' it would be more effective to rethink the nature of shipping as an economic activity that is one of the many interrelated processes that influences the planet's thin 'critical zone' on which all life depends (Latour, 2017; Lovelock, 2016).

The Politics of Big Numbers

The title of Rose George's book *Ninety Percent of Everything* (2014), alludes to a common claim: cargo ships transport 90% of everything (Economist Impact, 2023; OECD, 2023). Some put the number closer to 80% (UNCTAD, 2022), but the exact percentage matters little for our argument. The key message is clear: Shipping is big; shipping is important.

Environmentalists have picked up on this figure, arguing that if maritime transport plays such an out-sized role in the world economy then it would be a logical site for climate intervention, particularly if a reduction in shipping would be paired with a reduction in global consumption. Consuming less, this argument goes, would reduce

wasteful use of planetary resources and bring down shipping demand, leading to a reduction in global emissions (De Beukelaer, 2022, 2023).

This narrative is particularly appealing when viewed within the context of how the shipping industry has evolved over the past 100 years. Over the course of the 20th century, shipping transformed from a risky and often deadly business into a well-oiled machine that promises frictionless supply chains (see Sekula & Burch, 2010), inspired by military logistics developed during successive wars (Cowen, 2014; Khalili, 2020). Technological innovations and major investments increased ship sizes (Leivestad & Schober, 2021), facilitated inter-modal transfer of containerised cargo (Klose, 2015; Levinson, 2016), and connected bodies of water through canals (Fletcher, 1958; Lasso, 2019), while expanding ports to accommodate ever-growing ships and cargoes (Sharpsteen, 2011; van Veelen, 2022). Increased maritime transport thus has enabled spiralling energy and material demands while relying on fragile natural and geopolitical environments as conduits of trade. Meanwhile, the Anthropocene confronts us with planetary boundaries (Richardson et al., 2023). However, the transgression of these planetary boundaries remains mostly unseen to the rich thanks to the ceaseless import of resources and the export of invisible social and environmental 'externalities', even though it is the rich who have contributed disproportionately to their exhaustion (Biermann & Kim, 2020; Malm & Hornborg, 2014).

This narrative about maritime transport focuses on the highly unequal levels of consumption around the world, enabled by maritime transport. While some live lavish lifestyles, others don't manage to attain even the most basic 'decent living standards' because of inequitable resource distribution (Vélez-Henao & Pauliuk, 2023). The excess consumption is generated by the top 10% (including us, authors), who consume far more than our fair share of planetary resources. To reprise, the commonly repeated

argument is that consuming fewer things and consuming locally-sourced and manufactured goods would not only curb the wasteful consumption that is practiced disproportionately by the wealthy (Akenji et al., 2021), but it would also reduce demand for maritime transport. If 90% of what we consume is transported by sea, then bringing down consumption would foster equality *and* reduce carbon emissions of the shipping industry.

Environmentalists have paired the '90% of everything' statistic that appeals to the apparent significance of maritime transport with a parallel statistic that appeals to the apparent significance of the space in which that transport occurs: the ocean covers 71% of Earth's surface. Thus, the High Level Panel for a Sustainable Ocean Economy heralds the ocean as a 'climate solution' (Hoegh-Guldberg, 2019) because of its out-sized role absorbing both heat and carbon. Up to 20 Gt of CO_2 are absorbed by oceans every year (Wang et al., 2023), which is up to 20% more than previously thought (Landurant & Le Moigne, 2023). Considering that the ocean makes up just 0.12% of the planet's volume (a point we return to below) and that it has absorbed nearly 90% of global warming (Von Schuckmann et al., 2023), it seems clear that the ocean is an essential climate regulator. The implication of these appeals to the ocean's significance is that we need to take action if, as some assert, the ocean's capacity to continue playing that role is under immense pressure (Armstrong McKay et al., 2022; Lenton et al., 2023).

As rhetorical framings, these two figures – that 90% of everything is shipped by sea and that 71% of Earth's surface is ocean – serve similar purposes. They highlight the simultaneous enormity and fragility of the ocean as well as its importance for regulating both economic and geophysical systems. Yet the implications of these 'big' numbers are not so straightforward. Although the 'bigness' of shipping and the ocean

has been seized on by some to argue that is an essential area for climate intervention, the shipping industry has long used its size and implied importance to argue *against* taking climate action. As Koji Sekimizu, then Secretary General of the International Maritime Organisation (IMO), noted in 2015:

> … world leaders might be tempted to consider specific measures aimed at reducing shipping's overall contribution of CO_2 emissions, such as global overall cap. Such measures would artificially limit the ability of shipping to meet the demand created by the world economy, or would un-level the level playing field that the shipping industry needs for efficient operation, and therefore must be avoided. If such measures are enforced, it will seriously distort the shipping industry and have a serious impact on the economy of almost all nations. (Sekimizu, 2015)

Sekimizu was, in effect, arguing that the industry is too big to fail. If the industry's freedom to pollute is restricted, it could collapse and bring the entire world economy down with it, a vision that is dramatized in *Shipping Moves the World* (2024), an eight-minute video produced by the Union of Greek Shipowners that presents a dystopian scenario where maritime transport comes to a halt, outlining the impacts over days, weeks, and months. This argument about the essential nature of shipping is further bolstered by others who have noted that ships are the least polluting means of transport (expressed in GHG emissions per tonne-mile of goods transported) (ITF, 2023; Sims et al., 2014).

The contrast between a big useful industry and its comparatively small environmental impact is meant to sketch a favourable image of the industry. This juxtaposition further supports Sekimizu's admonition that one should be cautious in adopting regulations that may hinder the efficiency or profitability of this gentle giant that is crucial to the world economy. While the IMO has significantly increased its ambition to tackle climate change in the last decade (Bilgili & Ölçer, 2024; Bullock et

al., 2023; De Beukelaer & Smith, 2023), the industry continues to frame itself as both fundamental and relatively benign. For instance, the 2025 Report of the 18th Intersessional Working Group on GHG Emissions states: '…several other delegations…recalled that the shipping sector was responsible for less than 3% of global GHG emissions while around 80% of the world's goods are transported by sea, emphasizing the responsibility of the shipping sector with its crucial role in the global trade supply chain, in particular for the supply of agricultural goods' (ISWG-GHG 18/WP.1/Rev.1).

Recalibrating Shipping in a Sea of Numbers

As the previous section has demonstrated, even when the significance of the maritime transport sector and the fragility and importance of the ocean environment are recognised, the policy implications are not straightforward. Additionally, these numbers that celebrate the industry's importance are contestable. As we have noted, Rose George (and countless others) have written that '90% of everything' is transported by sea. By contrast, the NGO Circle Economy, using statistics gathered by the International Resource Panel, calculates that the metabolism of the global economy in 2021 was 101.4 billion tonnes of 'raw' materials (2022) and UNCTAD reports that 11.0 billion tonnes of goods were transported that year by ship (UNCTAD, 2022). If we accept both Circle Economy's 101.4 billion tonne material footprint and UNCTAD's 11.0 billion tonne maritime trade flow, then cargo ships transport only about 10.8% of 'everything' (See Figure 1).

[INSERT FIGURE 1 HERE]

Figure 1 Material Footprint versus Trade in 2021

In fact, these two figures (material footprint and trade) are not comparable because the two data sets measure different things. Circle Economy focuses on the metabolism of the globalised economy. This means they calculate all resources, including ores and energy, that are 'consumed' by the production processes that leave us with manufactured goods, edible food, and electricity. The processes that create a flow of consumer goods and services rely on resources totalling ten times the mass of the final, traded commodity. For instance, the material footprint of steel plates includes not just the plates that are traded but also the iron ore and energy (currently mostly coal) used in manufacturing the steel.

Additionally, the two sources of data differ because UNCTAD measures only what is traded *internationally*. Since UNCTAD uses data based on customs declarations, 'trade' refers only to goods that are transported across nation-state borders. This means that goods transported between Kinshasa and Brazzaville across the Congo River are counted in these statistics, but freight hauled by sea between Saint Petersburg and Vladivostok in the Russian Federation (some 6500 km as the crow flies) or between the islands of Kiritimati and Tarawa in Kiribati (some 3200 km) is not.

In sum, restricting 'everything' to goods that are traded internationally is problematic; it excludes both goods that are traded domestically and material inputs that are embedded in a commodity but not traded after the point of production. When the objective is Earth System governance (see e.g. Gupta et al., 2024), trade, let alone *international* trade, cannot simply be used as a proxy for the materiality of production and for the environmental impacts that result from the transformation of matter and its movement from location to location.

Just as the '90% of everything' figure can be questioned, so too can the figure that the ocean covers 71% of Earth's surface. This is an areal delimitation for a space

that, arguably, should more appropriately be measured volumetrically, especially when one's concerns are environmental processes and impacts. A range of other, volumetric, calculations are possible. The ocean's share of the planet's total volume is just 0.12% (Steinberg, 2014); it's share of the planet's 'critical zone' would be higher than 0.12% but still much smaller than 71%; its share of atmospheric space would be even smaller than 0.12%. Regardless, our point is not to establish a definitive number but to note as with the '90% of everything' statistic, a big number like '71% of the planet', in addition to having ambiguous policy implications, is itself contestable. Appeals to size and scale are problematic as starting points for policy arguments.

Rethinking Numbers in Shipping Policy

In 1609, the Dutch jurist Hugo Grotius claimed that ocean life is inexhaustible and maritime transport is harmless (Feenstra & Vervliet, 2009). We now know both these claims to be wrong. Overfishing has decimated marine life (Standing, 2022) and anthropogenic greenhouse gas (GHG) emissions significantly impact the oceans, through warming the water, raising sea levels, increasing acidification, and disrupting currents and conveyor systems (Merrie et al., 2014). While a single ship may do little harm, the tens of thousands of them that burn fossil fuels can do much harm, directly from shipborne GHG emissions, but also indirectly by enabling globalised consumer capitalism. This point was made abundantly clear in the 2024 International Tribunal of the Law of the Sea Advisory Opinion that explicitly frames GHG emissions from ships (and from all other sources) as pollution of the marine environment (ITLOS, 2024).

To illustrate, global warming leads to both a warmer atmosphere and warmer oceans. Warmer oceans evaporate more water into a warmer atmosphere that can hold more humidity. This results in more unpredictable weather patterns and more intense storms, which has implications for maritime transport (Hanson & Nicholls, 2020; Walsh

et al., 2019). Changes in rainfall can lead to floods and droughts, which can disrupt inland waterways and the waterborne traffic they allow. This has repeatedly affected cargo flows along the Rhine, with significant implications for German and Swiss industry as well as overseas shipping ("Droughts Leave Cargo Riverboats High and Dry," 2023). The Panama Canal has faced capacity reductions owing to reduced rainfall and concomitant water levels of the lakes feeding its many locks ("Severe Drought Is Constraining the Panama Canal," 2023). Rising sea levels also affect ports and port operations (Goodell, 2018).

What is at stake is not just the transition away from fossil fuels towards zero GHG propulsion of ships or toward producing and consuming locally. What is at stake is the need to transition to a global economy that can exist within a safe operating space for humanity (Gupta et al., 2024; Rockström et al., 2009, 2023). As part of this transition, oceans and waterways will need to be safe and reliable conduits for global trade, whether we think of shipping as representing 90% or 10.8% of 'everything', and whether we think of the planet as being 71% or 0.12% ocean.

Conclusions

The modern world is infatuated with scale and size (Smil, 2023). Carbon emissions need to be measured, aggregated into sector-wide numbers, and ultimately eliminated. Maritime transport's sizable contribution to global emissions (nearly 3%) has underpinned calls for reducing the industry's impact on climate change (Bows-Larkin et al., 2014; Bullock et al., 2022; Faber & Lee, 2020), either by reducing emissions per tonne-mile (i.e. more efficient ships) or by shipping less (i.e. reducing demand) (Balcombe et al., 2019; Bows-Larkin et al., 2015; De Beukelaer, 2022).

To this end, the uncritical quantification of shipping and the ocean – '90% of everything', '71% of the planet' – have played a prominent role in the campaign for

maritime awareness. These numbers give further weight to the observation that the ocean contains more carbon than either land or atmosphere and that it plays a hugely disproportionate role in absorbing excess heat due to climate change (Czerski, 2023).

However, any approach grounded on an uncritical appraisal of the 90% and 71% figures might lead to simplistic 'solutionism' such as restricting climate action to what is acceptable within narrow economic constraints or calling for 'local' production and consumption. 'Local' production and consumption is, perhaps counter-intuitively, not necessarily the best way to curb shipping emissions. Most of what is consumed is *not* transported internationally. Most resources used are already local; or at least *domestic* (see Figure 1). Additionally, as our discussion of material footprint has revealed, we need to focus on the total environmental impact of trade, not just transport. In this context, it might be more important to address the quantity of emissions and other environmental impacts *embedded* in goods (i.e. from the extraction and manufacturing of inputs) than how far the good has travelled. Potentially, the clustering of efficient production could reduce environmental pressures more than producing things closer to home, even if it would lead to a less significant reduction in the amount of goods transported by sea (Le Moigne & Ossa, 2021; McKinnon, 2024).

Planetary boundaries don't care about national borders (e.g. Rockström et al., 2024). Nor do finite resources care where or by whom they are used up. The challenges of climate justice through emissions reductions, meeting social thresholds within environmental boundaries, and ensuring a just and equitable transition are not easily confined to these frameworks for governance (Biermann, 2014; Freestone, 2011; Rockström et al., 2024). A narrow corridor exists for all people to live well within earth system boundaries (Gupta et al., 2024; Hickel, 2019; O'Neill et al., 2018), though not

without simultaneously correcting inequalities upwards and downwards. This requires a high degree of imagination when approaching both the economy and the environment.

An exclusive focus on maritime international trade provides an incomplete picture. Notwithstanding the significance of maritime transport and the role of reducing its GHG emissions in a global emissions reduction strategy, other efforts, including demand-side climate action (Creutzig et al., 2016, 2022; Grubler et al., 2018) and socio-cultural shifts to sufficiency (Herlitz, 2019; Robeyns, 2024; Wiedmann et al., 2020) remain necessary, even if challenging. Even if shipping *did* facilitate the transport of 90% of 'everything', a reduction in the tonne-miles transported by ship or an improvement in shipping's fuel efficiency would be just one of many efforts needed to make an impact on how global political economy affects the marine environment, let alone the global climate.

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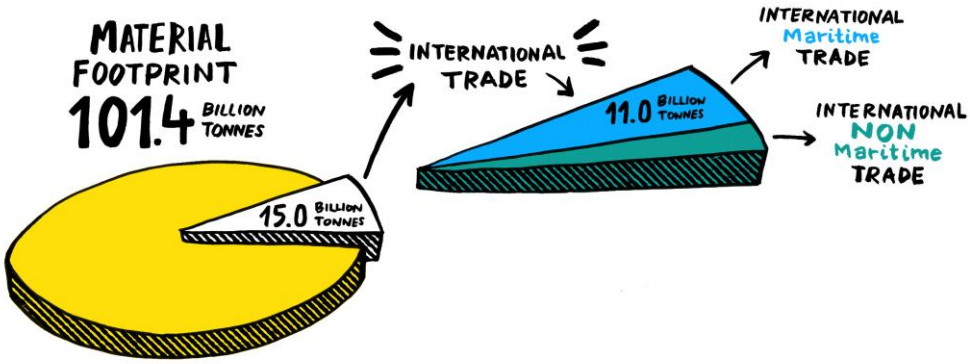
Figure 1:



Social Media Summary: Ships transport 80-90% of international trade, but only 11% of the economy's material footprint. This wide gap urges us to rethink common myths about the economy and the environment.