Ocean and Society
2026 • Volume 3 • Article 11894
https://doi.org/10.17645/oas.11894

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Open Access Journal

Geopolitical Upheaval Through Climate Measures: IMO and EU Decisions for International Shipping

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Submitted: 29 December 2025 **Accepted:** 14 May 2026 **Published:** 14 July 2026

Issue: This article is part of the issue "Ocean Climate Governance: Eclectic Viewpoints of a Multi-dimensional Nexus" edited by George Dikaios (Leiden University), fully open access at https://doi.org/10.17645/oas.i488

Abstract

The contribution of the shipping sector to the fight against climate change and, particularly, to the mitigation of greenhouse gas emissions has been high on the maritime agenda for the last decade. In this context, the International Maritime Organization and the European Union, two international organizations that strive to regulate shipping emissions, adopt several policies, measures, or tools to that end. This article explores whether and to what extent the decisions of the two respective organizations will have geopolitical repercussions that might affect shipping and trade operations. The findings, at least for the time being, suggest that existing climate policies are diverging, thereby increasing the complexity and uncertainty of the geopolitical landscape. This results in multiple potential scenarios concerning which countries will assume leadership in maritime fuel trading.

Keywords

climate geopolitics; climate policy; European Union; geopolitics; greenhouse gas emissions; International Maritime Organization; shipping

1. Introduction

For the past decade or so, the debate over reducing greenhouse gas (GHG) emissions from shipping has been prominent in climate change discussions. Although the sector contributes roughly 3% of global GHG emissions, its emissions have increased by 20% over the past decade (UN Trade and Development, 2023). This fact has led international actors, such as the International Maritime Organization (IMO) and the European Union (EU), to engage systematically with efforts that would lead to the decarbonization of the shipping industry.

The decisions of these two international organizations are expected to have a series of ramifications, including geopolitical repercussions.

The examination of this case offers an opportunity to explore whether the renewed attention to geopolitics—intrinsically connected to shipping and maritime affairs recently (Doppen et al., 2025; Polemis & Bentsos, 2025)—offers a convincing narrative to understand how climate decisions from influential international actors will affect aspects of international shipping and maritime trade. The article explores an under-researched topic in the literature, namely the connection between current climate developments, geopolitics, and shipping. The focus on geopolitics is rather topical, as the term regains significant attention in international affairs; the article takes a different path to understand how climate action interferes with geopolitics, and thus it emphasizes *climate geopolitics*, and what are the results of this entanglement in a field that more and more gets affected by politics.

To that end, the article cumulatively examines the IMO's and the EU's climate decisions for the following reasons: While the IMO is the responsible international organization to regulate all the aspects related to international shipping, it is the EU which endeavors to be a normative power in that field and export its shipping climate policy globally, in an attempt to make shipping greener (Dikaios, 2024). The EU has repeatedly pledged that it will follow the international system should it believe that it will substantially contribute to the fight against climate change. Else, it will be implementing its own, trying to lead the way for the rest of the world, especially the part of the world that has trade relations with the EU. It is worth noting that the global maritime industry accounts for over 80% of the world's trade, whereas 77% of European external trade and 35% of intra-EU trade by value are facilitated via sea routes (European Environment Agency & European Maritime Safety Agency, 2021). Thus, the EU has (or aspires to have) a say on how this trade will be made; currently, the EU's goal is to lead international shipping towards a green/climate transition.

In a recent article on the geopoliticization of energy policy, Herranz-Surralles (2024) argues that "the energy transition brought to the fore intense rivalries and geostrategic concerns about foreign energy investment and the dependencies created by global value chains of green technologies" (p. 2). Based on this, as well as on the aforementioned starting points, this article will attempt to analyze whether and to what extent the IMO's and the EU's climate decisions concerning shipping will have broader geopolitical repercussions. We investigate whether these initiatives influence the reconfiguration of global maritime power dynamics through the realignment of fuel supply and trade routes. After this introductory part, the article will take form as follows: First, a contextual part is presented justifying the reasoning behind the article; second, the discussion on green/climate/environmental geopolitics will be unfolded in an attempt to draw a conceptual framework; third, the current climate decisions of the IMO and the EU will be presented and the analysis of broader geopolitical repercussions will follow; finally, the concluding section will discuss the findings.

2. Context and Justification

In 1997, a "suggestion" made towards the IMO within the framework of the Kyoto Protocol of the United Nations Framework Convention on Climate Change (UNFCCC) set the agenda for the mitigation of GHG emissions from shipping. It was this semi-formal action that led to the first concrete attempt at GHG emissions reductions from shipping. However, it took the IMO over 20 years to create a more consistent policy proposal. More specifically, in 2018, the IMO adopted the Initial Strategy on Reduction of

Greenhouse Gas Emissions from Ships. At this point, it is interesting to mention that GHG emissions from ships are not taken into account when the percentage of each country's emissions is calculated. Further, shipping is exempted from the UNFCCC and its complements (Kyoto Protocol and Paris Agreement), which is the main framework of combating climate change. Lastly, it is also worth noting that, since 1992, the IMO is recognized as the responsible international organization to work on this matter.

The adoption of the Initial Strategy was considered a success for the IMO member states, as they managed to officially put the mitigation of GHGs from international shipping on the agenda. Nonetheless, the Initial Strategy did not gain a significant percentage of support within the Organization (Doelle & Chircop, 2019), leading to a weakened commitment. Additionally, the Initial Strategy is only an—initial, as its name suggests—roadmap for the examination of the possibility to reduce GHG emissions from ships by 50% by 2050 (based on the emissions of 2008). Nevertheless, and after a halt to the negotiations due to the Covid-19 pandemic (Dikaios, 2024), which created delays to the development of more specific measures on how the *initial* goal would be achieved, in July 2023, the 2023 IMO Strategy on Reduction of GHG Emissions from Ships was adopted. The ultimate goal of this Strategy is to achieve the target of net-zero for shipping emissions, by 2050.

Going back in time, one of the most significant international actors that put heavy pressure on the international community to adopt climate measures for international shipping was the EU. The reasons for this can be summed up in the latter's ambitious climate policy, which has been shaped within the EU's framework, one of the most comprehensive ones globally. In conjunction with its climate policy, the EU performs an active climate diplomacy in a series of international fora to promote climate-friendly policies for all and from all (Earsom & Delreux, 2021a). Within this framework, and with GHG emissions from shipping constantly growing, the EU has initiated internal measures since 2015, with an aim to convince the IMO to take action as well (Dikaios & Blavoukos, 2023; Earsom & Delreux, 2021b). After the adoption of the Initial Strategy in 2018, the new president of the European Commission was elected on the promise of the European Green Deal, which was presented in late 2019; the Deal's main goal was—and still is—to achieve climate neutrality in the European continent. Moreover, it encompasses specific measures directed to shipping, both internally and externally, targeting to decarbonize shipping and all related industries as much as possible.

The climate decisions both in the IMO and the EU, which have yet to be put into full operation, will probably lead to geopolitical changes. Mitigation of ships' GHG emissions will probably create new "green" corridors, or shorten the existing corridors allowing for new trade relations that are more climate- and environmental-friendly; they will also likely require a change in fueling, and thus, alter the global importance of some countries; they will, also, demand the development of new green(er) infrastructure to host this new green(er) trading activity and, as such, countries which are more prepared than others to build said infrastructure will potentially benefit. It is apparent, therefore, that the above decisions might have geopolitical repercussions, and alter the power or significance of some countries compared to others that today are important for international trade. This possible change of geopolitical status quo will coincide with the renewed attention given to geopolitics, which is yet again becoming a buzzword and an analytical tool (e.g., Bremberg & Michalski, 2024; Eichengreen, 2024; Herranz-Surralles, 2024). This was also highlighted by the recent reaction of the president of the United States, who demanded that the IMO not vote in favour of green rules in shipping (Lin & Brennan, 2025).

Nevertheless, as the IMO and EU work towards specifying or implementing their climate decisions, it is crucial to consider the potential impact on global trade patterns and the various actors involved. For instance, countries with extensive coastlines or significant maritime trade routes may be disproportionately affected by changes in shipping regulations. Similarly, countries that rely heavily on international trade may face challenges in adapting to new fueling requirements and infrastructure demands. By examining the interconnectedness of these factors, we can better understand the far-reaching implications of climate decisions on the global stage and identify opportunities for cooperation and adaptation (Wilmsmeier & Monios, 2020).

3. Towards Climate Geopolitics

According to Flint (2006), "geopolitics is the practice of states controlling and competing for territory" (p. 13). The writer also connects geopolitics to the "ideas of war, empire, and diplomacy" (Flint, 2006, p. 13). This, unsurprisingly, is a common understanding of the term geopolitics, which in the majority of—if not all—literature, is inextricably related with security issues and securitization (Mamadouh & Dijkink, 2006; Murphy et al., 2004; Ó Tuathail & Dalby, 1998). Coming back to Flint's perspective, geopolitics also has to do with the resources within a territory and, taking a step forward, "geopolitics is a way of 'seeing' the world" (Flint, 2006, p. 13).

Since the late 1990s, when the notion of "critical geopolitics" appeared (Dittmer & Gray, 2010), a part of the literature has also attempted to take a view on green geopolitics or climate change geopolitics. The growing challenges arising due to climate change and the (ab)use of resources, made some scholars—mostly coming from a political geography perspective—delve into it. Still, the literature is relatively limited and mostly coined by the political geographer Dalby (2003, 2013, 2014).

Dalby, in 2003, intertwined green/climate geopolitics with security. It was a period in time when almost the totality of the discussions around geopolitics focused on wars and great powers or on how the term is utilized publicly to create specific images of the world (Dittmer & Gray, 2010). Dalby considers environmental, climate, or green challenges as "postmodern" issues that transcend borders—a reality that goes beyond the traditional perceptions of demarcated spaces in a geopolitical worldview. He also allows the reader to assume that any "new" issue that will be added in any geopolitical discussion will not alter the way geopolitics influences strategies and power, but rather will append to the prevailing discourses. For Dalby, it seems that green geopolitics will be an area of contestation between which power will manage to develop the better suiting technologies and their control over resource possession, management, and processing. Therefore, our first expectation is that, under current climate policies, power contestation will focus on states with the most advanced technologies for producing and exporting alternative low- or zero-emission fuels, rather than on countries that produce traditional fuels, such as the OPEC countries.

Ten years later, Dalby (2013) repeated his argumentation, taking it a step further by adding that climate change as a geopolitical challenge falls into "the spaces of the global neo-liberal economy" (Dalby, 2013, p. 38). Accordingly, he writes about the reduction of geopolitical distances, applying an example of the past, i.e., nuclear power, to explain how climate change, as an anthropogenic activity, influences geopolitics. While shipping is indeed a crucial part of the global economy, is it a straightforward "pillar" of the neoliberal economy? Neoliberalism is an economic philosophy that emphasizes free market principles, privatization,

and deregulation, and while shipping is certainly a key component of global trade, it's not necessarily a direct reflection of neoliberal ideology.

The interpretation of climate change as a geopolitical issue within the spheres of the global neoliberal economy introduces the concept of geoeconomics, which is central to linking shipping and geopolitical significance. Luttwak (1990) initially defined geoeconomics in 1990, following the Cold War, prompting extensive scholarly debate that currently predominantly centers on whether it can substitute geopolitics (Shahzad, 2022), function as a tool for geostrategy (Lipkan et al., 2023), or be comprehended across various domains such as policy, military economics, and technology (Mohr & Trebesch, 2024). For the purposes of this article, the term will be used only to emphasize the geopolitical importance of shipping, without engaging in the debate surrounding the conceptualization of the term. Returning to the initial exploration of the concept of geoeconomics, within the neoliberal framework, geoeconomics emphasises the utilisation of economic strength, trade flows, and market instruments as means to exert geopolitical influence, i.e., market-based measures (MbMs). As economic globalization has progressed, economic interests have become integral components of the strategic priorities of states. In this context, economic and market instruments—including trade agreements, supply chain management, investment in critical infrastructure, and regulatory standards—have gradually supplemented or replaced traditional political and military tools, which were historically central to geopolitics (Topalidis et al., 2024).

Shipping does play a significant role in facilitating globalization and the movement of goods across borders, which is often associated with neoliberal economic policies, and therefore constitutes a key area in which geopolitical dynamics materialize. The globalization of trade and commerce has led to the growth of container shipping and the expansion of international trade networks, which have contributed to increased economic interdependence and connectivity across the world. Furthermore, shipping has indeed reduced distances between countries and regions by facilitating the rapid movement of goods over long distances. This has enabled global trade to grow and has had a significant impact on global commerce, culture, and communication. However, it's worth noting that while shipping has reduced distances in some respects, it has also created new forms of spatial inequality and connectivity. For example, some regions may be more connected to global markets than others, while certain communities may be more vulnerable to the impacts of globalization due to their geographical location or lack of infrastructure. In this sense, shipping both reflects and reshapes the geoeconomic landscape, redistributing power and dependence, thereby acquiring geopolitical significance.

Revisiting Dalby's arguments concerning climate geopolitics in 2014, he further substantiated his claims by asserting that, in addition to the tangible factors influencing geopolitics, there also exist intangible elements that are not directly linked to the conventional state-centric framework and its associated mechanisms (Dalby, 2014). The focus is turning towards "what is ruled over" (Dalby, 2014, p. 14) and by whom. The latter is closer to classic geopolitics and leads to the question of which powers are going to be prevailing in the new geopolitical landscape that the IMO's and EU's climate decisions on shipping construct. This also comes to add to a recent observation by some scholars that the green transition will lead to the rise of new leaders and the fall of new laggards, with transportation routes having to play a role in these developments (Vakulchuk et al., 2020).

The division between leaders and laggards has been a classical explanatory tool of countries' climate change performance, usually not being conceptualized but rather used as a categorization (Borzel, 2000; Liefferink et al., 2009; Tobin, 2017). The most prominent attempts to conceptualize leaders and laggards have been made by Knill et al. (2012) and Melidis and Russel (2020). Both pieces agreed on the definition of what one expects—leaders are the ones who either propose or are the first to implement an ambitious climate/environmental policy, while laggards are the ones who are either reluctant and indifferent to adopt such a policy or they purposefully sabotage it. In this article, a similar rationale will be followed so as to examine which countries will be the leaders and which will be the laggards in the new geopolitical context that climate change imposes on shipping. Accordingly, since nearly 50% of fuel trade is conducted via shipping (J.P. Morgan, 2025), our second expectation is that countries which implement climate decisions first—particularly those linked with changes in fuels—will be leaders in this trading reality; conversely, countries that are hesitant will be laggards.

The discussion on leaders and laggards is also enriched by the contribution of Barnett, who, in 2007, argued that climate change is a complicated geopolitical challenge, as those who emit anthropogenic GHG emissions and those who suffer the most from the impacts of climate change might differ (Barnett, 2007). In this article, one of the goals is to examine whether climate decisions can possibly change the strategic significance of countries or regions. Thus, this article distances itself from the deterministic point of view that geopolitics shared largely in the past (the geographic fate of each country) and moves towards strategic geopolitical thinking, where strategic decisions of some actors can affect the geopolitical weight of others.

4. Conceptual Framework for Climate Geopolitics

Before engaging in the broader analysis, we elucidate how we conceptualize geopolitical repercussions, effects, and change within the specific context of climate change and international shipping.

Drawing on critical geopolitics (Dittmer & Gray, 2010), and more specifically on Dalby's work on green/climate geopolitics (2003, 2013, 2014), climate geopolitics is understood here as a field of contestation over which actors can develop the most suitable technologies and secure control over possession, management, and processing of resources (Dalby, 2003). Crucially, climate geopolitics also brings into focus intangible, non-state-centric factors that can shape geopolitical dynamics beyond state borders. This opens space for a variety of actors, entities, and organizations to exert influence—for our purposes, most notably the EU's and IMO's climate regulatory frameworks on shipping. This emphasis not only intensifies competition over resources but also prompts further questions about what is ruled over and by whom (Dalby, 2014). In this article, *geopolitics* is therefore understood, through the lens of climate geopolitics, as the manner in which the arrangements of resources, technologies, and infrastructures among various powers can be influenced by both tangible and intangible factors, including regulatory measures enacted by the IMO and the EU.

Within this framework, we distinguish between *geopolitical repercussions*, *effects*, and *change*. Although there is no single, widely accepted definition of these terms, the academic literature that employs them allows us to identify some key distinctions. Namely, *geopolitical effects* refer to observable shifts in incentives, behavior, or positions that do not necessarily modify the overall structure of the international system. *Geopolitical repercussions* also pertain to observable shifts but describe indirect and unintended consequences (Burrows & Harris, 2009; Gupta et al., 2018; Mampuys et al., 2025). In the context of this

article, this signifies that efforts to mitigate ships' GHG emissions driven by the IMO's and the EU's climate policies, as well as the promotion of alternative fuels, will likely necessitate changes in fuel utilization and the development of new, environmentally friendly infrastructure and technologies to support this emerging trade pattern. Furthermore, climate policies may establish new "green" corridors or shorten existing ones, thereby enabling trade relations that are more aligned with climate and environmental objectives. In contrast, *geopolitical change* refers to structural transformations within the international system (Cohen, 1991; Forbes, 2003). It concerns the ways in which these effects and repercussions can reshape the relative global importance of specific powers. In our context, such changes may be recognized as advantageous to states that are more effectively equipped to develop the requisite infrastructure and adopt essential technologies, thereby facilitating the identification of potential leaders and laggards in the green transition within the maritime sector.

It is notable that the term *geopolitical change* appears more frequently in earlier literature, whereas more recent analyses tend to refer to *geopolitical effects*, *geopolitical repercussions*, or *risks*. This change may reflect the emerging international order, which exists between a highly fluid power landscape—where alliances are temporary—and a structure based on multiple blocs (Mampuys et al., 2025).

Given the complexity of analyzing geopolitical change, our article examines whether the IMO's and EU's climate decisions for shipping generate such change by focusing on two core dimensions. The first is regulatory power, which captures how these decisions use rule-making, standard-setting, and MbMs to influence the choices of other actors. Geopolitical effects at this level include the ability to extend regulatory preferences beyond one's own jurisdiction. The second is economic-strategic positioning, which concerns the distributional implications of climate decisions for fuel producers and trade. Geopolitical repercussions here include the emergence of new fuel hubs, green shipping corridors, and port alliances, as well as risks of carbon leakage and the relocation of transhipment hubs. These two dimensions provide the analytical framework for examining the geopolitical effects and consequences of the IMO's and EU's climate decisions and support our discussion of leaders and laggards, enabling us to identify which countries are likely to assume leadership and which are likely to lag behind within the new geopolitical landscape imposed by climate change on shipping, and thus to trace potential geopolitical shifts.

5. Research Design

This article adopts a qualitative policy content analysis, combined with doctrinal policy analysis, to examine how climate regulations in international shipping may generate geopolitical repercussions. The analysis focuses on policy and regulatory content, specifically the EU's Fit for 55 package and the 2023 IMO Strategy on Reduction of GHG Emissions from Ships, encompassing short-term measures implemented by the IMO to reduce GHG emissions. Additionally, potential repercussions on key variables—such as fuel markets and trade patterns—are mapped. The selection of these policies is based on the fact that the EU and the IMO are the only two international organizations that have adopted climate measures to decarbonize the shipping sector and are expected to shape part of the future shipping activity, influencing how the rest of the world will develop respective policies. Nonetheless, the article does not seek to provide a definitive causal explanation of fully realized geopolitical changes; rather, it advances theoretically informed expectations and scenarios concerning how IMO and EU climate policies for shipping may influence the incremental reorganization of maritime relations along regulatory and economic-strategic dimensions.

The analysis is supplemented by scholarly literature and empirical observations, including fuel uptake and alliance positions from 2019 to 2025. The selection of particular policy content related to the IMO was intended to focus on climate-related decisions adopted and employed within international shipping. It is noteworthy that the IMO has adopted other climate measures that are more indicative than prescriptive, such as the resolution Marine Environment Protection Committee (MEPC) 376(80) regarding Guidelines on the Life Cycle GHG Intensity of Marine Fuels (Life Cycle Assessment (LCA) guidelines), which clarifies that these guidelines are not intended to serve as a comprehensive IMO GHG inventory for international shipping. Concerning the EU, measures related to climate decisions in the maritime sector with territorial extension were analyzed, specifically the EU Emissions Trading System (ETS) Maritime and FuelEU Maritime. Both extend their regulatory reach to intercontinental voyages, thereby their impacts are felt beyond EU borders and influence international shipping activities (Dobson & Ryngaert, 2017; Scott, 2014). As the topic at hand is under-researched, the analysis begins from the official documents of the international organizations and, through a process that resembles the snowball effect, which is used for under-explored studies (Ting et al., 2025), it follows the lead that is given through the reports and literature on the future scenarios in the fuels markets and the maritime trade.

6. Climate Decisions on Shipping

This section analyzes the climate decisions of the IMO and the EU on maritime transport through two core analytical dimensions. The first dimension concerns regulatory power. It explores how the IMO's and EU's climate decisions on shipping use rule-making, standards-setting, and MbMs to steer the behavior of other actors. The geopolitical implications at this level include the capacity to project regulatory preferences beyond their own jurisdictions. The second dimension concerns economic-strategic positioning. It analyses the distributional effects of climate decisions on fuel-producing countries and trade. Geopolitical repercussions here include the emergence of new fuel hubs, green shipping corridors, and port alliances, as well as the risks of carbon leakage and relocation of transhipment hubs. In conjunction, these two aspects provide the analytical framework for assessing the geopolitical effects and repercussions of IMO and EU climate policies on shipping.

6.1. Regulatory Power

6.1.1. IMO

In July 2023, the MEPC of IMO adopted the 2023 IMO Strategy on Reduction of GHG Emissions from Ships (hereafter referred to as the Revised Strategy). The goal was to complement and put into force what had been agreed at the Initial Strategy in 2018, which was deemed insufficient. The Revised Strategy marks a significant advancement in setting more robust objectives as it "strengthened the ambitions for international shipping compared with the Initial Strategy's ambition for a 50% GHG reduction by 2050" (DNV, 2023, p. 12). In more concrete terms, it represents the Organization's initial commitment to achieve near-zero GHG emissions. Specifically, the Revised Strategy delineates two indicative checkpoints: (a) a 20% reduction in emissions by 2030, accompanied by an additional non-legally binding effort of 30%, and (b) a 70% reduction by 2040, with a further targeted reduction of 80% (IMO, 2023, p. 6).

Simultaneously, for reaching the targets mentioned above, the potential coupling with other short-term measures, such as the Carbon Intensity Indicator (CII) aiming at enhancing the energy efficiency of ships, were emphasized in the text (IMO, 2023, p. 8). Among the existing technical and operational measures, it is worth mentioning, in addition to CII, the Energy Efficiency Existing Ship Index (EEXI). These are both mandatory measures adopted within the framework of the Initial Strategy, with implementation having started in 2022 for EEXI and in 2023 for CII, for all ships, i.e., existing and new (IMO, 2021). EEXI concentrates on design parameters, whereas CII evaluates operational efficiency for existing vessels. Both measures greatly impact vessel speed and the supply–demand dynamic, targeting carbon fuel-based ships with a goal to cut GHG emissions by 30% by 2030, as outlined in the Revised Strategy. Their effectiveness is scheduled for review in January 2026 (IMO, 2021).

Although it is apparent that the IMO has made some efforts to acknowledge and address the issue of emissions in international shipping, the text of the Revised Strategy does not explicitly reference complete decarbonization within its vision. Instead, it states that the IMO remains committed to reducing GHG emissions, with an aim to phase out emissions as expeditiously as possible (IMO, 2023, p. 5). This hesitance from the part of the Organization to commit to the decarbonization of international shipping can be attributed to the fact that, prior to the adoption of the Revised Strategy, at MEPC 78 no consensus could be reached regarding whether the 2050 target date would imply a phase-out or a state of net-zero emissions, or whether the Revised Strategy should encompass only CO_2 or additional GHG emissions as well. These differences in opinions have prevented the MEPC from adopting a document that sets forth an ambitious target of net-zero GHG emissions by 2050 (Handl, 2023). Although there is significant room for increased ambition in the Revised Strategy, it is scheduled for revision in 2028 concerning the established level of ambition for reducing emissions in international shipping (IMO, 2023).

6.1.2. EU

On the contrary, as articulated in Section 2, the EU has developed one of the most comprehensive frameworks for climate policy, culminating in the presentation of the European Green Deal in 2019, which establishes an ambitious objective of achieving climate neutrality by 2050, by prioritizing the transformation of the economy and the reduction of carbon footprints across all sectors. In this context, with regard to the shipping industry, the European Commission (2025) seeks to advance its objectives through two primary strategies: firstly, by improving energy efficiency to minimize fuel consumption, and secondly, by advocating for the adoption of renewable and low-carbon fuels to facilitate a shift towards cleaner energy sources.

The Fit for 55 package, which is the interim implementation package of the European Green Deal with the goal of reducing emissions by 55% by 2030, was published in 2021. Moreover, regarding the decarbonization of shipping, one of the most significant legislation initiatives of the package is the extension of the EU ETS to the maritime sector (EU ETS Maritime; European Commission, 2025). ETSs, in general, are categorized within the so-called market-based measures (MbMs). In the context of decarbonizing the maritime sector, these measures employ economic incentives and disincentives to encourage shipping companies to reduce their emissions and to invest in innovative, regulation-compliant technologies and fuels. This can be achieved either by imposing a tax (levy) on maritime bunker fuel or by establishing a specific annual emissions cap that requires companies to buy or sell emissions allowances to meet their respective emission reduction targets, as in the case of an ETS (Christodoulou et al., 2021; Harahap et al., 2023; Lagouvardou et al., 2020). The EU extended its ETS to the maritime sector, covering CO_2 emissions from all large ships entering EU ports from January 2024,

regardless of their flag. The latter ensures that emissions from maritime transport are included in the overall ETS cap, which sets the maximum amount of GHGs that can be emitted within the system. Overall, the cap decreases over time to ensure that all ETS sectors contribute to the EU's climate objectives; this ultimately promotes energy efficiency and low-carbon solutions and reduces the price gap between alternative fuels and traditional maritime fuels (European Commission, 2025).

Furthermore, central to the decarbonization of the maritime sector, aside from the EU ETS, is the introduction of Regulation 2023/1805 on the use of renewable and low-carbon fuels in maritime transport (FuelEU Maritime). This regulation aims to promote the consistent use of renewable and low-carbon fuels in maritime transport across the EU (Regulation of 13 September 2023, 2023). It sets a maximum limit on the GHG content of energy used by ships that arrive at, stay in, or depart from ports under the jurisdiction of a member state, while promoting the use of on-shore power supply or zero-emission technologies in ports under the jurisdiction of a member state. The regulation also applies to large ships exceeding 5,000 gross tons, regardless of their flag (Regulation of 13 September 2023, 2023, Article 1). The FuelEU Maritime Regulation complements the extension of the EU ETS Maritime, aiming to progressively decrease the GHG intensity of fuels utilized in voyages to and from European ports. The geographical scope of both regulations extends beyond European voyages—defined as voyages between member states—to include intercontinental voyages, which involve voyages from a member state to a third country and vice versa (Kotzampasakis, 2023). Thus, ships that do not meet the acceptable technological and fuel standards established by EU ETS Maritime and FuelEU Maritime can be barred from entering the EU's internal market (Regulation of 13 September 2023, 2023). Historically, the EU market has served as a conduit for the "Brussels effect," where the requirement to access the EU encourages third countries to align with EU standards, prompting them to amend their laws to remain competitive (Blazo, 2025), extending the EU's regulatory influence beyond its borders. It is worth noting that previous research on EU–IMO relations in climate change (Dikaios, 2024) found that the EU was unable to exert significant influence at the international institutional level. Nonetheless, the analysis in this article indicates that specific EU maritime climate policies with extraterritorial effects possess the potential to influence other actors within the international system (Blazo, 2025; Otto, 2025).

Ultimately, both the IMO and the EU have enacted climate measures targeting GHG emissions from shipping (see Supplementary File), but they differ significantly in scope, legal nature, enforcement mechanisms, and geopolitical implications. In particular, the IMO, as the "competent international organisation," is responsible for establishing global rules and standards on shipping safety, security, and environmental protection (Li & Fu, 2025). Its Revised Strategy aims to cut emissions by 70–80% by 2040 through an overall framework supported by mandatory operational and technical measures, i.e., EEXI and CII, that apply to all international shipping activities, regardless of flag. Compliance varies between these binding measures—enforced mainly via mandatory reporting and port inspections—and the non-binding Revised Strategy, which sets sector-wide goals and checkpoints (IMO, 2021, 2023). Notably, the lack of a clear phase-out date and legally binding regulations on technological and fuel advancements raises concerns about the IMO's consistency with the Paris Agreement's long-term temperature targets, as well as future technological and fuel investments by countries. Conversely, the EU has established a broader and more stringent regional framework, including measures such as the EU ETS Maritime and FuelEU Maritime, which apply to both intra-EU and international voyages. These measures impose binding obligations on shipping companies and port authorities and are supported by detailed monitoring, reporting, verification rules, financial penalties for

violations, and access restrictions to EU ports for ships entering or leaving European ports (European Commission, 2025; Regulation of 13 September 2023, 2023), expanding the EU's regulatory influence beyond its borders. Collectively, the EU's maritime climate policies encourage the adoption of alternative fuels and the improvement of energy efficiency in shipping. Nevertheless, their extraterritorial influence could induce geopolitical tensions, as certain third countries interpret the EU's measures as unilateral, potentially constituting trade discrimination, and as encroaching upon the IMO's role as the principal global regulator of international shipping. This aspect will be examined in the subsequent section, which will focus on economic-strategic positioning, prompted by the climate policies of both the IMO and the EU.

6.2. Economic-Strategic Positioning

6.2.1. Fuel Geopolitics

To analyze the potential impact of these climate initiatives, it is essential first to comprehend the alternatives to traditional fossil-based bunker fuels and to understand the role that they may play in driving a shift in fuel demand and benefiting specific countries. More specifically, the research conducted by Mahia Prados et al. (2024), which identified maritime fuels, indicates that six types of fuels are currently utilized or possess the potential for utilization by the maritime sector, namely fossil fuels, electrofuels (e-fuels), blue fuels, hydrogen, and nuclear energy. Within the category of fossil fuels, liquefied natural gas (LNG) and liquefied petroleum gas (LPG) are also included, along with a sub-category known as biofuels, which are derived from a combination of fossil fuels and environmentally friendly organic mixtures (Mahia Prados et al., 2024). Based on the relevant literature (Christodoulou & Cullinane, 2022; Handl, 2023; Harahap et al., 2023; J.P.Morgan, 2025), which discusses the most promising low- and zero-carbon maritime fuels in the context of decarbonizing the maritime sector with regard to efficiency, and in alignment with recent climate policy decisions, the fuels identified include LNG, hydrogen, ammonia, and bio-methanol.

To begin with, LNG, a gas derived from fossil fuels, is regarded as one of the most promising low-carbon fuels due to its compatibility with existing ship engines. In addition, LNG is distinguished from alternative options by its significantly higher technical and operational maturity (Christodoulou & Cullinane, 2022; Handl, 2023). Since 2019, the United States has been the leading contributor to LNG export capacity, accounting for more than half of the total (International Energy Agency, 2025). While LNG produces lower emissions compared to other fossil fuels, it still falls into the fossil fuel category, and a methane slip occurs during combustion that limits its classification as a short-term drop-in or intermediate fuel. Since methane is a potent GHG, LNG alone cannot fully decarbonize the maritime sector (Christodoulou & Cullinane, 2022). Despite aligning with present IMO decisions, more specifically, LNG is expected to achieve a higher energy efficiency rating under the CII assessment (Mahia Prados et al., 2024). The EU's stricter climate policies will begin to favor cleaner fuels, especially from 2026 onwards, as the EU ETS Maritime cap decreases and expands to cover more GHGs, including oxides and methane. This shift may impact LNG's use, as indicated by the significant drop in scheduled LNG carrier deliveries after 2028 (Lloyd's List, 2025).

Continuing with methanol, especially bio-methanol—which is produced from carbon-neutral sources—is seen as one of the emerging leading alternatives for decarbonizing the maritime sector. Its primary advantages include its significant flexibility, as it can be used in fuel cells or internal combustion engines, prompting many companies to order methanol-fueled ships (Handl, 2023; Harahap et al., 2023).

Furthermore, its importance has increased again amid geopolitical tensions from the war in Ukraine and rising LNG prices, leading shipping companies to invest more in methanol-fueled vessels. For example, Alphaliner reported a 28% increase in dual methanol–gas oil engine vessels from 2021 (Mahia Prados et al., 2024). A notable drawback is that methanol production depends on biomass availability, and large-scale manufacturing could threaten food security, as biofuels are often made from crops (Handl, 2023). Although bio-methanol aligns with IMO regulations, its deployment faces specific limitations that prevent full compliance with the EU framework. Importantly, biofuels from food or feed crops are not consistent with FuelEU Maritime (Regulation of 13 September 2023, 2023). Because of limited availability and these restrictions on ships arriving, staying, or departing from European ports, investing in bio-methanol might be a short-term, less costly option.

Among the leading zero-carbon fuel options are hydrogen and ammonia. There are various methods of producing them both; if sourced from carbon-free elements, they can be considered acceptable long-term marine fuels. Moreover, green hydrogen and ammonia offer development opportunities for numerous countries (Handl, 2023). Nevertheless, their development is associated with various safety concerns, such as explosiveness and environmental damage in the event of leaks, as well as substantial capital investments required for new engine technologies (Harahap et al., 2023; Institute for Energy Economics and Financial Analysis, 2025). Currently, IMO safety regulations prohibit the use of hydrogen and ammonia due to hydrogen's high explosiveness and ammonia's toxicity (Christodoulou & Cullinane, 2022). Simultaneously, in the EU's climate framework, there is an understanding of these restrictions alongside recognition of hydrogen's vital role in achieving climate neutrality. Hence, to ensure its production from renewable sources and support its development, the European Commission published a hydrogen strategy in 2020 for a climate-neutral Europe. This strategy is further complemented by a document outlining EU regulations for renewable hydrogen (European Commission, 2020; European Parliament, 2023).

Unlike traditional fuels such as oil and gas, which are produced only in certain geographic regions, low- and zero-carbon fuels depend mainly on technology and infrastructure for their production (Altiparmak, 2023; Morgan, 2025). As mentioned above, zero-carbon options such as green hydrogen and ammonia offer opportunities for countries that have not been major fuel producers to gain a competitive edge in the alternative fuel shift and reduce their dependence on fossil fuels. Japan has reduced its energy consumption of short-term fuels such as LNG and has implemented various energy and climate strategies, including the Sixth Strategic Energy Plan, to decrease LNG exports and promote renewable energy sources (Institute for Energy Economics and Financial Analysis, 2025). Japan's and South Korea's National Action Plans submitted to the IMO emphasize hydrogen- and ammonia-powered ships as high-potential vessels, with plans to implement these engines by 2030 (Ministry of Land, Infrastructure, Transport and Tourism, 2020; Ministry of Oceans and Fisheries, 2023). Additionally, South Korea intends to establish 14 hydrogen ports by 2040 and create legal frameworks to facilitate the transition to a hydrogen economy (Ministry of Oceans and Fisheries, 2023). Singapore is advancing a multi-fuel bunkering approach, employing interim solutions such as biofuels and electrification, alongside long-term options like ammonia and hydrogen, and has signed a Memorandum of Understanding with Rotterdam and a Memorandum of Cooperation with Japan, to harmonize standards for future marine fuels (Maritime and Port Authority of Singapore, 2022). Meanwhile, Norway has established an ambitious goal to make its ports emission-free by 2030 through the provision of on-shore power supply and comprehensive bunkering services for hydrogen and biogas (Norwegian Government, 2019). Currently, the supply infrastructure needed for low- and zero-carbon shipping fuels, i.e., green

hydrogen and green ammonia, is located all in Europe and the Baltic. Importantly, for some of these fuels, i.e., bio-methanol and green ammonia, there is little to no supply infrastructure available outside European waters (Mahia Prados et al., 2024).

Although projects for alternative fuels are not currently the main trend in international shipping, there is an indication that they are beginning to gain momentum and will play a significant role in long-term maritime decarbonization. In this transition, leadership is likely to be assumed by countries with advanced infrastructure, such as electrified ports and fuel bunkering facilities, as well as cutting-edge technology, particularly in electrolysis, which is essential for hydrogen production. This supports our initial expectation that, under existing climate policies, the competition for power is likely to revolve around countries capable of producing and exporting low- or zero-emission fuels, rather than those focused on traditional fuels. However, IMO's more modest and less binding targets, which favor short-term fuels like LNG, could put forward-looking countries at a disadvantage and enable traditional fuel producers to retain their influence.

6.2.2. Trade Realignment

The divergence between the IMO's global approach and the EU's regional measures is likely to result in varying rates of transformation across international shipping. This may lead to the emergence of two distinct dynamics within established maritime routes, as the regulatory scope of FuelEU Maritime and EU ETS Maritime extends to international maritime activities, encompassing all large ships arriving, staying, or departing from European ports.

In particular, considering that we are approaching the mid-century and the targets for decarbonization are also increasing—for instance EU ETS Maritime will reduce the set limit (cap) for emitted emissions, and FuelEU Maritime will reduce the energy intensity allowed to 80%—the cost for emitting carbon and using traditional fuels in European ports will be much higher in contrast to alternative fuels (Regulation of 13 September 2023, 2023). Nonetheless, due to the fact that these initiatives are regional and not global, the cost of entering European ports might prompt ships to reroute to avoid regulatory costs. Generally, the implementation of MbMs such as the EU ETS at the regional level within the shipping sector presents the risk of carbon leakage. This implies that shipping companies may register their vessels in other jurisdictions or engage in maritime trade in different geographical regions to circumvent the additional costs imposed by regional ETSs (Christodoulou & Cullinane, 2024). Furthermore, there is a potential risk that specific carbon pricing schemes might induce the relocation of European transshipment hubs to competitors in near non-European regions, thereby altering maritime routes to circumvent additional costs (Lagouvardou & Psaraftis, 2022). Such shifts are possible to occur only if carbon prices and compliance costs related to EU climate policies become significantly higher than the costs of non-compliance, which is not the case at present (Christodoulou & Cullinane, 2024).

Simultaneously, a second trend has emerged, recognizing that the costs associated with compliance in a more regulated market—stemming from international and regional climate initiatives—will enable smaller participants to surpass larger, slower-moving competitors. As the delay in compliance with new regional and international climate regulations lengthens, the financial impact will increase, thereby widening the gap between those who act proactively and those who do not (Lloyd's List, 2025). Thus, numerous countries have undertaken significant initiatives in recent years to facilitate this transition.

More specifically, while reducing speed is a measure employed by ships to comply with climate regulations—particularly for CII and EEXI, established by IMO—without necessarily utilizing low- or zero-carbon fuels, it may result in delays in the estimated time of arrival; potentially impact the total volume of transshipment goods adversely; and fail to keep pace with increasingly stringent regional climate regulations. In alignment with the climate commitments adopted by the IMO, in November 2021, during COP26, 22 countries signed the Clydebank Declaration. The signatory nations acknowledge the imperative transition to environmentally sustainable maritime fuels and the worldwide accessibility of land-based infrastructure to facilitate such fuels. They endorse the creation of green corridors, which are zero-emission maritime routes connecting two or more ports, and by 2025, they aim to establish at least six green corridors (Department for Transport, 2021). To that end, the United Kingdom has initiated funded studies for green corridor routes between the United Kingdom and Ireland, the Netherlands, Norway, and Denmark, in order to reduce the risk of future investments in these corridors (Department for Transport, 2025). It is noted that, aside from the Clydebank Declaration and MEPC's overall endorsement of the green corridor concept, it has not yet obtained formal international legal recognition (Handl, 2023).

Nevertheless, numerous corridors are actively enhancing their preparedness for zero-emission voyages. For instance, Singapore, Rotterdam, and Gothenburg have each successfully conducted ship-to-ship methanol bunkering trials. Additionally, Singapore and several other ports are currently engaged in safety and feasibility assessments for ammonia bunkering (Boyland et al., 2023). At the same time, the Australia–Japan Iron Ore route for zero-emission ammonia, the Portugal–Brazil route for green hydrogen, and the Shanghai–Long Beach route were also introduced (Pole Star Global, 2025). Thus, green corridors are linked to strategic investments and alliances in eco-friendly ports and fuels, drawing attention from the EU, especially the European Commission and the Directorate-General for International Partnerships. Moreover, the European Commission launched an ambitious initiative, the Global Gateway Green Shipping Corridor (GGGSC), to facilitate the transition to sustainable, renewable, and low-carbon fuels for international shipping while also contributing to sustainable development at the global level (Christidis et al., 2024). The identified potential partner countries for this project include Morocco, other African nations, Chile, Colombia, and Panama; all of which have existing trade agreements with the EU. Furthermore, based on Christidis et al. (2024) research, which identifies suitable ports for this corridor, any investments in GGGSC ports could alter shipping costs, making them more cost-effective for participating countries, and could also influence the port's standing within the global logistics chain. Finally, the research also emphasizes that the alternative networks developed through the establishment of GGGSCs can circumvent chokepoints and the subsequent geopolitical risks associated with those points (Christidis et al., 2024).

Hence, our analysis of economic-strategic positioning indicates that countries such as Norway, Singapore, Japan, and several EU member states, including Ireland, the Netherlands, and Denmark, have already initiated projects for alternative fuels and advanced infrastructure. Their proactive approach to implementing climate policies affords them a competitive advantage and establishes them as leaders amid this transition. This leadership could be further reinforced through the creation of "green corridors." Consequently, this supports our second expectation that countries that implement climate policies early will become leaders in this evolving trading landscape. Conversely, hesitant countries risk falling behind. Nevertheless, owing to disparities between global regulations, such as those established by the IMO, and regional regulations, exemplified by the EU, transshipment hubs may relocate to competitors, potentially leading to alterations in maritime routes as shipping companies seek to avoid increased costs associated with stricter climate policies.

7. Concluding Remarks

Both IMO and EU have implemented climate measures aimed at reducing GHG emissions from shipping. These initiatives are driving shifts in energy and fuel geopolitics, increasingly focusing on low- and zero-carbon fuels such as LNG, bio-methanol, green hydrogen, and ammonia. The choice of the most favorable option varies depending on the climate framework employed. Moreover, currently LNG is one of the most popular fuels, largely supported by the IMO's climate framework. However, it is not favored by the EU's long-term climate policies due to concerns over methane slip. Similarly, biofuels, i.e., bio-methanol, are supported by IMO but face scrutiny under the EU's stricter rules, as large-scale bio-methanol production may threaten food security. In contrast, hydrogen and ammonia are seen as promising alternative shipping fuels because they can achieve zero carbon emissions. Nonetheless, the IMO's current safety framework restricts their use and discourages capital investment, whereas the EU has created a safety framework to facilitate the safe adoption and stimulate investment in hydrogen technologies.

Our first expectation was that, under current climate policies, power contestation would focus on states with the technology to produce and export low- or zero-emission fuels, rather than on traditional fuel-producing countries. Our analysis initially confirms this, as the competition mainly lies between technologically advanced countries and regions making long-term commitments: Singapore is developing multi-fuel bunkering for biofuels, electrification, ammonia, and hydrogen, Japan and South Korea aim to introduce hydrogen- and ammonia-powered ships by 2030, and Europe possesses the necessary supply infrastructure for low- and zero-carbon shipping fuels. While our hypothesis appears to be initially supported, the IMO's more modest and less binding targets, which favor short-term fuels such as LNG, can disadvantage forward-looking countries and allow traditional fuel producers to remain influential. For instance, while the United States has led LNG exports since 2019, in 2024 over 70% of LNG exports came from the Middle East, including the United Arab Emirates, and in 2022 significant amounts originated from the Republic of Congo, ensuring that OPEC countries remain key players (U.S. Energy Information Administration, 2024). At the same time, this introduces complexity in investing in specific long-term alternative fuels for shipping.

Our second expectation was that countries that implement climate decisions early—particularly those related to fuel changes—will be leaders in this new trading reality, while countries that hesitate will fall behind. In particular, our analysis highlighted examples like Norway, Singapore, Japan, and several EU countries such as Ireland, the Netherlands, and Denmark, which have already established advanced infrastructure and projects for alternative fuels. These efforts, aligning with stricter climate policies, should theoretically give them a competitive advantage and position those countries as leaders in this transition, supporting our second expectation. Nonetheless, our findings also show this is not always the case. Due to differences between global and regional measures, there are also situations where these leaders' competitive advantages are not fully realized. For instance, transshipment hubs may relocate to competitors, and maritime routes could shift as shipping companies seek to avoid additional costs from stricter climate regulations.

To sum up, our main objective was to investigate whether international climate policies, especially those established by the IMO and the EU concerning the maritime sector, could alter the strategic standing of different countries or regions. Considering that geopolitics is the process of observing and creating scenarios

regarding the influence of geographical necessities on political events and on changes in political situations in states (Hagan, 1942), our analysis revealed that current climate decisions are diverging in two different directions, making the geopolitical landscape more complex and uncertain. This creates several possible scenarios regarding which states will lead in maritime fuel trading. The competition for influence may not be limited to a simply rivalry between traditional fuel exporters, such as OPEC countries, and producers of alternative fuels. Instead, both groups could play important roles depending on how the climate framework evolves. Thus, there are numerous potential outcomes for how global power and trade relations around fuels might shift in response to these policy changes. Furthermore, the differences between the IMO and EU climate frameworks highlight that approaches of green geopolitics often focus on questions about governance, technological advancement, and resource control. However, these approaches typically assume the adoption of a single, comprehensive climate policy. In practice, since climate decisions can diverge, we cannot predict a single set of geopolitical changes; instead, it is important to consider a range of scenarios based on which policies are adopted. To that end, the initiatives of the IMO and the EU could foster innovation; however, they also pose risks of creating inconsistencies, compliance challenges, and imbalances in competitiveness. Finally, they open new *corridors* for future research, especially when the implementation of these measures is in full operation and changes to the system(s) are visible.

Acknowledgments

The authors would like to thank the three anonymous reviewers and Billy Tsagkroni for their constructive feedback. GD would like to thank the participants of the ECR workshop "The Return of Geopolitics or a New Age of Multiplexity? EU and Global Governance in the 21st Century" at the 12th SGEU Conference 2024 for their comments on an earlier draft. GD would also like to warmly thank Mina Akhavan for her contribution to the editorial work of this issue.

Funding

Publication of this article in open access was made possible through the institutional membership agreement between Leiden University and Cogitatio Press.

Conflict of Interests

In this article, editorial decisions were undertaken by Mina Akhavan (University of Amsterdam).

LLMs Disclosure

Grammarly has been used to a limited extent for proofreading and improving language clarity. No AI tools were used for content generation or writing.

Supplementary Material

Supplementary material for this article is available online in the format provided by the author (unedited).

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