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The Potential Implications of the Designation of the Mediterranean Sea as an Emission Control Area (ECA) on the Competitiveness of the Suez Canal

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ABSTRACT

Purpose: *The Suez Canal, an essential maritime corridor, is poised for a transformative change with the upcoming designation of the Mediterranean Sea as an Emission Control Area (ECA) in 2025. Even though maritime transport is one of the least polluting modes in terms of greenhouse gas emissions, it is now under increased regulatory scrutiny, especially from the International Maritime Organization (IMO), which is imposing stringent emission reduction standards. These regulations, although environmentally driven, may influence the shipping industry's cost dynamics and its preference for sea born transportation routes. This research addresses three pivotal questions: Will the inception of the ECA impact the income volume through the Suez Canal? What are the chances that shipping lines might opt for alternative maritime routes? And how will these factors together influence the Suez Canal's competitive edge? This paper seeks to delve into the potential ramifications of ECA regulations on the competitive perspective of the Suez Canal versus the Cape of Good Hope route.*

Design/Methodology/Approach: *The methodology amalgamates a comprehensive cost comparison with an extensive literature review.*

Findings:

1. *Competitive Advantage of Suez Canal Route: The Suez Canal route, despite the application of ECA regulations and the associated use of pricier VLSFO fuel in the Mediterranean Sea, remains economically competitive. As stated in Table (5), the total costs for the Suez Canal route amount to approximately $1,195,139.6, which is extensively less than the Cape of Good Hope route's costs of about $1,455,531.32, resulting in savings of approximately $260,391.72.*
2. *Time Efficiency: The Suez Canal route offers a significant time advantage, approximately saving around 14 days of transit compared to the Cape of Good Hope route. This shorter transit duration further underscores its economic attractiveness, especially for shipping operators dealing with time-sensitive cargoes.*
3. *Impact of ECA Regulations: The introduction of ECA regulations in the Mediterranean Sea, necessitating the use of VLSFO, has not deterred the financial advantages of the Suez Canal route. Although the Cape route gains from the cheaper IFO380 fuel, the savings from the Suez Canal's shorter distance and the absence of the longer voyage's additional fuel consumption compensate the higher fuel costs associated with ECA regulations.*
4. *Decision Dynamics in the Maritime Industry: Shipping companies face an ongoing challenge in decision-making, having to constantly weigh fuel costs, time efficiency, and applicable tolls. The current research emphasizes that, despite the looming regulatory changes, the Suez Canal's economic and time benefits position it as an attractive option in global maritime trade.*

Key-words:
Emission, Greenhouse, Suez Canal, Alternative Route, cost, competitiveness.

1. INTRODUCTION

Maritime shipping is indispensable to global trade, yet its contribution to Greenhouse Gas (GHG) emissions is substantial. According to the International Maritime Organization (IMO, 2014), the industry was responsible for about 2.2% of global CO_2 emissions in 2012. Without effective mitigation measures, such emissions from the sector are projected to rise by up to 250% by 2050 (IMO, 2018). Recognizing the gravity of the situation, a significant regulatory adjustment was made in 2021, where sulfur limits for Non-Emission Control Areas (Non-ECAs) were markedly reduced from 3.5% to 0.5%. This move epitomizes the industry's responsiveness and commitment to curbing environmental impact.

The IMO has taken practical measures to address maritime shipping emissions and reduce their environmental impact. The IMO's initial strategy, adopted in 2018, sets ambitious goals for the shipping industry, including a target to reduce total annual GHG emissions by at least 50% by 2050 compared to 2008 levels (IMO, 2018). To achieve these targets, the IMO has implemented various measures as outlined in MARPOL Annex VI. Among these strategies, a key initiative has been the establishment of Emission Control Areas (ECAs); ECAs are specific regions where stricter emission standards are applied to vessels, targeting pollutants such as sulfur oxide (SOx), nitrogen oxide (NOx), and particulate matter (IMO, 2020). The primary objective of ECAs is to mitigate the environmental impact of shipping activities and enhance air quality in coastal areas and sensitive ecosystems.

The designation of the Mediterranean Sea as an ECA for Sulphur Oxides and Particulate Matter presents both challenges and opportunities for the maritime industry, particularly concerning the Suez Canal, a crucial strategic route. Starting from 1 May 2025, vessels transiting the Mediterranean will be mandated to use fuel oil with Sulphur content limit of 0.10% m/m, a significant reduction from the 0.50% m/m enforced outside ECAs. While this move ensures enhanced environmental protection and cleaner air for Mediterranean coastal populations, it could also have profound economic implications for the Suez Canal.

Given the Suez Canal's proximity and its role as a pivotal transit point for vessels navigating the Mediterranean, ship operators might encounter elevated operational costs due to the stricter fuel requirements. This change could make alternative routes, such as the Cape of Good Hope, more appealing, especially if they do not necessitate the same stringent fuel standards. However, the Suez Canal's advantage of reduced sailing time remains, and the canal's competitiveness might hinge on balancing these time efficiencies against the new fuel-associated costs.

With the Mediterranean now joining other ECAs like the Baltic Sea, North Sea, and North USA coastal areas, global maritime stakeholders are witnessing a clear trajectory towards sustainable shipping. For the Suez Canal Authority, this underscores the necessity to strategize and adapt, ensuring that the canal remains an attractive choice amidst evolving environmental regulations and shifting economic dynamics.

The purpose of this study is to evaluate the economic consequences of designating the Mediterranean Sea, encompassing the Suez Canal, as an ECA. The maritime shipping industry is a notable contributor to global GHG emissions. Consequently, ECAs have been proposed as a strategic measure to restrict these emissions and lessen the maritime sector's environmental footprint. However, the introduction of an ECA in the Mediterranean could precipitate elevated operating expenses for vessels navigating the Suez Canal, potentially making alternative routes more economically attractive. Considering this potential scenario, this research endeavors to address three pivotal inquiries.

The first question investigates whether the existence of an ECA would result in a reduction of income and number of ships passing through the Suez Canal. This analysis considers the higher running costs associated with ECAs in comparison to alternative routes, aiming to determine the potential decrease in trade volume passing through the canal.

The second question explores the probability of shipping lines opting for alternative routes instead of passing through Suez Canal the Suez Canal due to the implementation of an ECA. Factors such as the strictness of ECA regulations, fuel price differentials, and environmental concerns will be assessed to understand the decision-making process of shipping lines.

The third question aims to evaluate the overall impact of ECAs requirements on the competitiveness of the Suez Canal. By integrating the findings from the previous analyses, this research seeks to provide insights into the strategic importance of the canal, potential shifts in shipping routes, and the long-term implications of its market share.

2. LITERATURE REVIEW

The role of the shipping industry in global trade is paramount, with approximately 90% of worldwide goods being transported via maritime routes. Nevertheless, the environmental implications of such extensive operations are significant and pose a considerable challenge (Stopford, 2009). Efforts to moderate the industry's GHG emissions have been undertaken extensively.

The IMO has been at the forefront of initiatives aimed at curbing the shipping industry's GHG emissions. The organization released a detailed study on the industry's emissions as part of its Third IMO GHG Study (IMO, 2014). This comprehensive study confirmed that international shipping is a significant contributor to global GHG emissions, despite being an energy-efficient method of transporting goods. The study suggested that without further action, shipping emissions could rise significantly due to the growth of the world economy and associated demand for maritime transport. This was followed by the release of the Initial IMO Strategy on Reduction of GHG Emissions from Ships, which outlined a comprehensive plan for reducing emissions by half by the mid-century (IMO, 2018). This is a strategic document outlining the IMO's commitment and approach to reducing GHG emissions from ships. The strategy set forth a vision, which confirms IMO's commitment to reducing GHG emissions from international shipping and, as a matter of urgency, to phasing them out as soon as possible. This includes reducing total annual GHG emissions by at least 50% by 2050 compared to 2008, while pursuing efforts to phase them out entirely.

The concept of ECAs is one of the strategies being pursued to combat GHG emissions in the shipping industry. ECAs are defined as sea regions where stricter regulations are implemented to minimize airborne emissions from ships, as dictated by the MARPOL Annex VI regulations (IMO, 2020). Numerous studies have examined the potential economic and environmental impacts of ECAs.

Brynolf, S., Magnusson, M., Fridell, E., & Andersson, K. (2014) explored compliance alternatives for forthcoming ECA regulations on shipping emissions. Examining heavy fuel oil (HFO) with SCR and seawater scrubber, marine gas oil (MGO) with SCR, and liquefied natural gas (LNG), it found all methods reduced impacts on particulate matter, ozone formation, acidification, and terrestrial eutrophication but had minimal effect on climate change. The SCR system curbed NOx emissions, necessitating ammonia slip regulation. While LNG has benefits, unchecked methane slip could negate its environmental advantages. The performance of scrubbers in ships warrants further research, and economic considerations are key in compliance strategy selection.

Cullinane, K., & Bergqvist, R. (2014) discussed emission control areas and their impact on maritime transport. The paper also highlights the significant environmental potential of abatement technologies and alternative fuels in maritime transport within emission control areas (ECAs). Despite the vast scale of maritime shipping, its emission levels remain relatively lower than other transport modes. However, operators face complex decisions regarding the adoption of suitable measures and strategies for compliance. Stricter future ECA regulations might prompt shipping companies to prioritize energy efficiency measures. Furthermore, the importance of designating more areas as ECAs is emphasized, given the socio-economic benefits and challenges of pollution in densely populated regions. The paper also points to the need for additional regulations, particularly addressing concerns like ammonia slip from SCRs and methane slip from LNG engines.

The study of Chang, Y.-T., Park, H. (Kevin), Lee, S., & Kim, E. (2018) analyzed the impact of ECAs regulations on European port efficiency using the SBM Data Envelopment Analysis (DEA) and bootstrapped truncated regression (BTR) models. The findings revealed that ECA regulations could lead to a negative effect on port efficiency. Specifically, ports under ECA regulations experienced an average efficiency decline of 0.058 to 0.066 on a 0-1 scale, representing a 15-18% efficiency loss from their average scores. This research is significant as it pioneers the assessment of ECA regulations' influence on European port efficiency using robust analytical methods.

In the study of Zhang, Q., Liu, H., & Wan, Z. (2022), an investigation into the effectiveness of the Emission Control Area (ECA) policy within four main port cities in the Yangtze River Delta (Shanghai, Suzhou, Ningbo, and Nanjing), yielded heterogeneous results. Using the regression discontinuity (RD) method, the research revealed a notable reduction in SO_2 concentrations due to ECA policy implementation in Shanghai and Suzhou at the 1% significance level. However, in Ningbo and Nanjing, the policy did not statistically impact SO_2 concentrations. These findings underscore the varied effectiveness of the ECA policy across different port cities, emphasizing the need for tailored policy improvements based on regional disparities.

Another study by Jiang, R., & Zhao, L. (2022) on the effects of IMO sulfur limits on the international shipping company's operations, delves into the impact of IMO Sulphur limits on international shipping operations using a game theory perspective. Key findings reveal that ECA regulations compel shipping companies to adjust vessel speeds: when specific conditions hold, vessels sail at maximum speed, rendering the regulations inconsequential to optimal speeds. Conversely, in the presence of heightened transit inventory or fixed costs, companies opt for decreased freight volumes and higher speeds. However, higher fuel prices or diminished efficiency prompt a reduction in both speed and freight volume. The competitive landscape also affects freight volume decisions. These insights stem from detailed mathematical proofs and models assessing operational adjustments in response to regulatory measures.

3. METHODOLOGY

To examine the potential impacts of ECAs on the competitive advantage of the Suez Canal route compared to the Cape of Good Hope route, this research employs a dual methodology: comparative cost analysis and a thorough literature review.

Assumption 1 - Via the Suez Canal Route: The first scenario assumes that the ship sails from the port of Ras Tanura, Saudi Arabia, to the port of Rotterdam, passing through the Suez Canal. This route is traditionally shorter, leading to quicker transit times. The Suez Canal is one of the world's most crucial maritime shortcuts, greatly reducing the journey between Europe and Asia, and thereby making trade faster and often more economical.

Assumption 2 - Via the Cape of Good Hope Route: The second scenario assumes that the ship sails from Ras Tanura to Rotterdam via the Cape of Good Hope route. This route, while longer, can sometimes be more economical, especially during times when Suez Canal tolls are high or when there are potential wait times and delays at the Canal. The Cape route was chosen as an alternative due to its historical significance as a primary maritime route before the Suez Canal's construction and is still relevant today in specific circumstances or considerations.

Firstly, the study gathers comprehensive data on the current global market prices for Very Low Sulfur Fuel Oil (VLSFO) – the fuel type mandated within ECAs – and Intermediate Fuel Oil 380 (IFO380) fuels. This data are sourced from reputable international maritime fuel suppliers and cross-verified with industry reports to ensure maximum accuracy and relevance.

Subsequently, using this data, operational costs for ships using each type of fuel are calculated. This process takes into consideration variables such as the vessel's fuel efficiency, distances travelled, and operational speeds.

Alongside these quantitative analyses, a comprehensive literature review is conducted. This review explores the existing knowledge on the economic viability and environmental implications of ECAs in the maritime shipping industry. This provides a context to the numerical findings reached by the researchers, integrates current knowledge, and identifoes gaps where needed.

When evaluating alternate shipping routes, the extended travel distances, and additional sailing times needed to avoid the Suez Canal and instead use the Cape route are considered. These costs are then examined in light of consideration for specific charter agreements.

For vessels operating under **time charter parties**, opting for the longer route may not yield the anticipated savings from using cost-effective IFO380 fuel. Despite the fuel's lower price, the extended sailing duration could lead to additional fuel consumption and prolonged charter periods, effectively increasing the operational costs borne by the charterer, who typically covers fuel and canal transit fees. On the other hand, for vessels operating under **voyage charter parties**, though the Cape route might initially appear cost-efficient due to fuel consumption savings, any potential savings could be offset by the cumulative costs of the extended journey and the canal fees, both of which are typically borne by the owner and significantly impact the operation cost.

After assessing these factors, a comprehensive comparison will be made to gauge if the benefits of IFO380 fuel savings can truly compensate for the added costs linked to the Cape route's longer travel time and distance.

This combined methodological approach ensures a comprehensive understanding of the economic implications of ECAs, fuel type selection, and routing decisions within the shipping industry. However, it is worth noting potential limitations such as fluctuating fuel prices and variations in ship efficiency rates. These are mitigated by considering a range of potential values in the analysis.

By investigating the economic feasibility of implementing ECAs on the Suez Canal, this study aims to illuminate potential benefits and challenges associated with ECA implementation. The findings of this study can guide policy discussions and decision-making processes related to emissions reduction strategies in the shipping industry, contributing to the broader goal of reducing GHG emissions and mitigating climate change.

4. RESULTS AND ANALYSIS

The focus of this study is a comparative cost analysis aimed at investigating the differential in operating costs when using VLSFO mandated within ECAs, versus the cost of IFO380 fuel. The central objective is to establish whether this cost difference is substantial enough to prompt shipping vessels to alter their navigational routes. Specifically, the study assesses whether vessels would choose to circumvent Suez Canal and instead traverse via the Cape route.

The analysis of route competitiveness in maritime shipping between the Suez Canal and the Cape of Good Hope is complex, influenced by various factors, not least of which is the cost-effectiveness of each route. One of the major elements determining this cost-effectiveness is operational expenses, primarily fuel costs and transit fees. However, these costs are not static. They fluctuate due to various market dynamics and regulatory measures. For the purpose of this study, the researchers target a specific price period and recognize this as a constraint in their analysis.

Table 1 compares the fuel prices (IFO380 and VLSFO) per ton in United States Dollar (USD) at different locations and calculates the average price and percentage difference for each type.

Table 1: Average Fuel Price

Fuel Type	Rotterdam Market Price Per Ton ($)	Fujairah Market Price Per Ton ($)	Singapore Market Price Per Ton ($)	Average Price per ton ($)	Average Percentage Difference (%)
IFO380	448.5	423	435	435.83	27.7%
VLSFO	539	559	572	556.67	

Source: Ship & Bunker

For the purposes of this study, the researchers base their analysis on the voyage of a tanker ship with a of 150,000 DWT, setting sail from Ras Tanura to Rotterdam. The comparative analysis encompasses two potential routes: one via the Suez Canal and the other via the Cape of Good Hope.

Parameters for the Study

- **Ship Specifications**: The ship under consideration for this study is a tanker with a deadweight of 150,000 tons.

- **Sailing Speed**: An average sailing speed of 14 knots is assumed for the voyage.

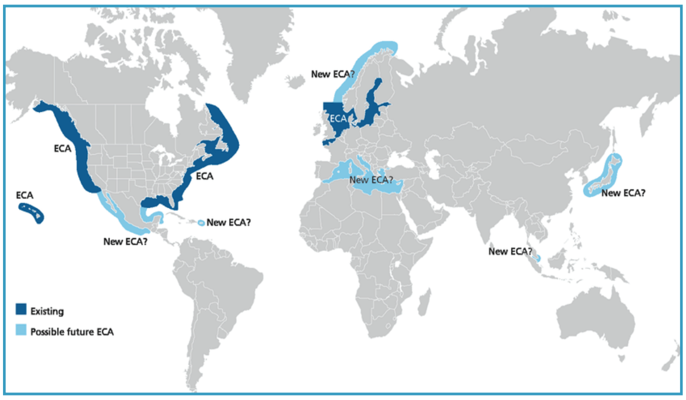
- **Ras Tanura to Rotterdam (via Suez Canal) total Distance and Segments:** Based on measurements from the electronic chart display and information system (ECDIS) simulator, the overall distance between Ras Tanura and Rotterdam spans 6,467 nautical miles. This encompasses various segments as shown in the Table II, including distances between Ras Tanura and Port Said, Port Said and Gibraltar, Gibraltar to the entrance of the English Channel, and the entrance of the English Channel to Rotterdam.

Table II: Suez Route Segments

Route Segment	ECA (miles)	Non-ECA (miles)
Ras Tanura to Port Said		**3180**
Port Said to Gibraltar	**1980**	
Gibraltar to the Entrance of the English Channel		**930**
Entrance of the English Channel to Rotterdam	**377**	
Total distance	**2357**	**4110**

Source: ECDIS Simulator

- **Ras Tanura to Rotterdam (via Cape route) Total Distance and Segments:** The total journey distance measures approximately 11,169 nautical miles, as indicated in Table III. These measurements are based on calculations from the ECDIS simulator. When consulting the ECA map, it becomes evident that via this route, vessels can predominantly circumvent most of the ECAs, except for the regions of the English Channel and the North Sea.



Map 1: Showing the global existing and new ECAs
Source: research Gate

Table III: Cape Route Segments

Route Segment	Applying ECA (miles)	Not applying ECA (miles)
Ras Tanura to the entrance of English Channel	10,792	
Entrance of English Channel to Rotterdam		377
Total Distance	10,792	377

Source: ECDIS Simulator

- **Daily Fuel Consumption**: The ship's fuel consumption rate is presumed to be 50 tons per day.

- **Fuel Prices (2023)**: Based on data from the Oil Price Information Service (OPIS, 2023), the average fuel prices used for calculations are $556.67/ton for VLSFO and $435.83/ton for IFO380.

- **Suez Canal Toll**: For the Suez Canal route, a transit fee of $325,000 is considered, based on the toll rates specified for a 150,000 DWT tanker (Suez Canal Authority, 2023).

- **Voyage Running Costs (other than fuel)**: Excluding fuel expenses, the voyage incurs a running cost which amounts to 50% of the total operational costs (Haakon and Lindstad 2013). To facilitate the calculation of running costs, excluding fuel, the researchers assume both routes using IFO380 fuel. Given that fuel expenses represent 50% of the voyage's running costs, the total distance of both routes is considered to estimate the equivalent amount for other operational expenses.

Table IV: Voyage Running Cost Other Than Fuels (Both Routes)

Description	Suez rout	Cape route
Total voyage distance (miles)	6,467	11169
Voyage time by days (SP 14 Knts)	19.25	33.24
Average daily consumption (ton)	50	50
Voyage total fuel consumption (tons)	962.5	1662
Fuel Price ($/ton)	435.85	435.85
Fuel consumption cost of by $	419,505.625	724382.7
Voyage running cost $(other than fuel 50%)	419,505.60	724382.7

Source: Data compiled by the author.

5. RESULTANT COSTS:

In the maritime industry, understanding the breakdown of voyage costs, especially regarding fuel consumption, is crucial for decision-making. One of the most significant expenses for ships is fuel. As highlighted by Stratiotis (2018), fuel costs typically represent about 50% of a ship's total running cost. To better illustrate these dynamics, the tables below provide a comparative analysis of two different routes and their associated expense.

This comparison considers both the distance traveled and the type of fuel utilized, further breaking down costs into fuel expenses and other running costs. The detailed breakdown of Voyage running cost (Suez route), along with other traces of the voyage, can be found in Table V below.

Table V: Voyage Running Cost (Suez route)

Description	Fuel type as per the segmented voyage		Total
	IFO380	VLSFLO	
Distance segmented (miles)	2357	4110	6467
Voyage time by days (SP 14 Knts)	7.02	12.23	19.25
Average daily consumption (ton)	50	50	50

Voyage total fuel consumption (tons)	529.5	433	-
Fuel Price ($/ton)	351	611.5	-
Fuel consumption cost of by $	185,854.5	264,779.5	450,634
Suez Canal Toll $ (for 150,000 DWT tanker)	-	-	325,000
Voyage running cost $(other than fuel 50%)	-	-	419,505.60
Total voyage running costs ($)	-	-	1,195,139.6

Source: Data compiled by the author.

The detailed breakdown of Voyage running cost (Cape route), along with other traces of the voyage, can be found in Table VI below.

Table VI: Voyage Running Cost (Cape route).

Description	Fuel type as per the segmented voyage		Total
	IFO380	VLSFLO	
Distance segmented (miles)	10,792	377	11169
Voyage time by days (SP 14 Knts)	32.12	1.12	33.24
Average daily consumption (ton)	50	50	50
Voyage total fuel consumption (tons)	1606	56	-
Fuel Price ($/ton)	435.85	556.67	-
Fuel consumption cost of by $	699,975.1	31,173.52	731,148.62
Voyage running cost $(other than fuel 50%)	-	-	724382.7
Total voyage running costs ($)	-	-	1,455,531.32

Source: Data compiled by the author.

Both primary maritime routes, the Suez Canal and the Cape of Good Hope, have unique dynamics when it comes to cost and efficiency. Table V provides a detailed breakdown of the costs associated with the Suez Canal route, segmented by fuel type and considering the implications of the ECA regulations. Meanwhile, Table 6 delineates the voyage costs for the Cape of Good Hope route.

Suez Canal Route (as detailed in Table V): Holding the variables constant, the aggregate costs for the journey via the Suez Canal amount to approximately $1,195,139.6. This figure incorporates the significant toll for the Suez Canal, which substantially adds to the overall expenditure.

Cape of Good Hope Route (as illustrated in Table IV): By contrast, the Cape route, which side steps canal tolls and primarily uses the less costly IFO380 fuel, accumulates a total cost of around $1,455,531.32. Even with the benefit of bypassing canal tolls and the more extended journey, this route has a higher cost than its Suez Canal counterpart does by roughly $260,391.72.

Intriguingly, even with the introduction of ECA regulations in the Mediterranean Sea, the Suez Canal route, as outlined in Table V, continues to be a competitive choice from a fiscal perspective. While the Cape route's primary financial advantage hinges on the cheaper IFO380 fuel, the Suez Canal route offers savings, even factoring in the pricier VLSFO due to ECA standards. Combined with its shorter transit duration (around a 14-day saving), the Suez Canal emerges as a highly appealing option for maritime operators, especially those handling time-sensitive cargoes.

In the broader maritime industry context, decisions will be a continued balancing act between assessing fuel costs, time efficiency, and relevant tolls. Notwithstanding the ECA regulations in the Mediterranean, the advantages of cost and time as presented in Table V for the Suez Canal route stand strong, underlining its continued allure and importance in global maritime trade given the current economic and regulatory landscapes.

6. CONCLUSION

In conclusion, this paper aimed to analyze the economic viability of implementing an ECA in Suez Canal, a key strategic route in the maritime shipping industry. Maritime shipping, despite being the least emitter of GHG among transportation modes, is under scrutiny to further reduce emissions due to the increasing volume of goods transported seaborne and the consequential rise in the number of operating vessels.

The advent of ECAs, while serving to minimize GHG emissions, also contributes to an increase in shipping costs due to the necessity of using costlier low-sulfur fuels. This could potentially impact the competitiveness of routes like the Suez Canal that may implement such regulations, given that fuel costs constitute a significant portion of a ship's daily running expenses.

The researchers' analysis, based on publicly available data, indicates that implementing an ECA in the Suez Canal might have implications for the canal's income. The increased costs associated with the utilization of low-sulfur fuels might push shipping companies to consider alternative routes, notably the Cape of Good Hope. Such a shift could potentially alter the Suez Canal's standing as a favored maritime route.

However, route selection in maritime transport involves a careful balancing act, considering not only direct costs but also factors such as transit times, and environmental implications. Consequently, despite the apparent cost-saving benefits of alternative routes, shipping lines must also account for the longer journey times, potential weather risks, and greater ship strain associated with these paths.

As the industry continues to balance environmental responsibility and operational costs, strategies such as fuel-efficient ship designs, alternative fuels, and optimal routing data analytics will likely become increasingly important. This study highlights the intricate balance the maritime industry must strike between environmental responsibilities and economic realities. By analyzing the potential economic ramifications of implementing an ECA in the Suez Canal, the research underscores the significance of proactive planning in response to changing environmental regulations. The ultimate goal is twofold: to assist the maritime sector in lowering GHG emissions, thereby combating climate change, and to provide valuable insights for stakeholders when determining optimal shipping routes in the future.

7. RECOMMENDATIONS

The Suez Canal Authority can pursue several strategies to enhance its environmental sustainability without compromising its competitiveness. These could include:

Potentially revising toll fees: considering adjustments to the current pricing structure for vessels using the canal. Given the tight competition in cost-effectiveness between the Suez Canal and Cape of Good Hope routes.

Investment in Green Technologies: By encouraging and supporting the use of green technologies such as scrubbers or LNG propulsion systems, the Suez Canal can contribute to a reduction in emissions without increasing the cost of passage by applying ECA. For instance, the Authority could offer discounted toll rates for ships that employ these technologies.

Operators explore platforms like ABB's OCTOPUS Marine Software. This application, already utilized by many major shipping companies, offers real-time insights into ship performance, weather conditions, and optimal route planning. By leveraging such technology, startups and existing ship operators can better navigate the challenges of environmental regulations and fuel costs, making informed decisions that are both economically and environmentally sound.

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