

ADDRESSING CLIMATE CHANGE THROUGH INNOVATION AND COLLABORATION: PFMS MODEL FOR SHIPPING SECTOR

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Abstract

Our world is how we made it. The current day air quality in the cities we live is the result of collective actions and decisions we took for our world in the past. Today more than 80% of global trade is carried out through oceans, global trade is all through shipping, and shipping is least polluting mode of transportation. All the raw materials consumed by manufacturing sector, oil, gas, petroleum products, iron ore, coal, grain and other merchandise are moved across the world through oceans. Because of the scale of operations and increasing international trade, the harmful effect of shipping on environment needs to be monitored. Although less but it is negatively impacting oceans and thus contributing to the climate change. There are several organizations and initiatives contributing to the cause of fighting climate change and proactively addressing the cause, all have not received same amount of success. This research work is an effort to understand the initiatives and organizations contributing towards decarbonization in shipping and green shipping and also deep dive into the rationale behind the possibilities of their success in long run. These green initiatives will fundamentally change the way we build, use and exploit maritime ecosystem for global trade. It is high time we understand that our initiatives need to be novel as well as unique in the approach and should be based on conviction that protecting nature and our earth is a collective responsibility, achievable only through collaborative efforts.

INTRODUCTION

Today we are at a stage wherein the most critical pressing issue is climate change. This brings to us a compulsion to work together, collaborate and act. This is an emergency situation impacting entire globe and so we have all the reasons to work together as a team to address our problem. More than 80% of global trade is facilitated by ocean transportation. All the raw materials consumed by manufacturing sector, oil, gas, petroleum products, iron ore, coal, grain and other merchandise are moved across the world through shipping. On the valid assumption that global trade of goods will increase over the years, shipping is and will remain the best mode of transportation and hence it will grow with increase in global trade of goods. This presents a big opportunity for further investment in shipping industry.

This fact highlights the value oceans add to the current day world, but there are some ugly facts which are not helping the world. Over fishing, dry and wet waste dumping in oceans, oil spills from ships, and other hazardous activities are leading to ever rising ocean temperatures and sea levels, marine pollution, devastating impact on marine environment and so on. GHG emissions from shipping is 3%, which can rise up to 100% by 2050, compared to emissions on 2008. (Faber & Lee, 2020) Despite minimum emission among all transportation modes(Balcombe et al., 2019), shipping can potentially contribute to increasing emission in coming times

Hence initiatives and innovations on large scale needs to be implemented in order to restrict and gradually decrease emissions from shipping activities.

Decarbonization challenge:

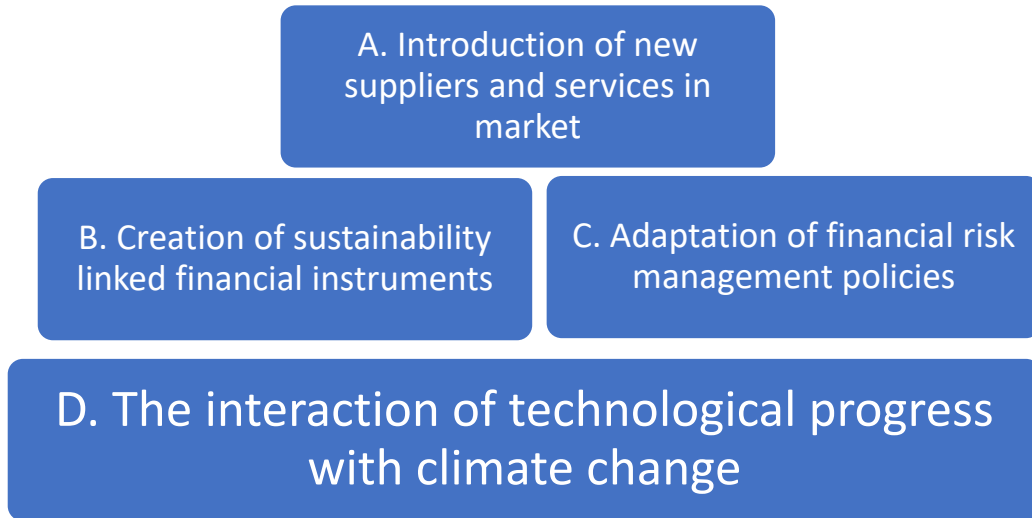
Over the last decade, emissions from the shipping industry have shown significant trends. According to the International Maritime Organization (IMO), shipping accounted for nearly 3% of global human-caused CO₂ emissions in 2018. Between 2012 and 2018, CO₂ emissions from shipping grew by 10%, with methane emissions rising by 145% due to increased use of natural gas as a marine fuel. (ICCT, 2024; IMO, 2020)

From 2010 to 2019, CO₂ emissions from international shipping showed fluctuations but generally trended upward. Emissions could continue to grow without additional policy interventions, as per one estimate emissions could increase by 16% from 2018 to 2030 and by 50% by 2050.(ICCT, 2024; International Energy Agency, n.d.)

Any activity if needs to be controlled, there should be check on the sources of its nutrition and energy. If today we are looking to reduce emissions and carry out decarbonization in shipping, it is essential to understand how can we control the source of its nutrition. For any business activities including investments, funding is the key. If funding can be monitored and controlled, the end results can be governed. Idea is to let money flow in sustainable activities, sustainable investments and through it sustainable businesses. Investors should be motivated to invest in green funds by providing them with opportunities to invest in sustainability

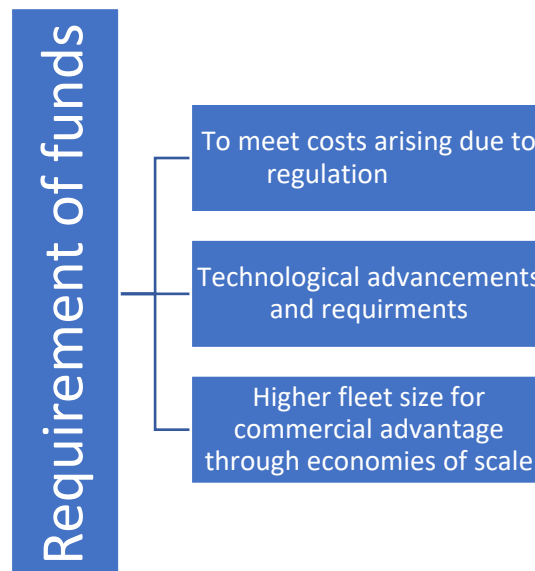
through appropriate instruments and mechanisms. As per 2019 research conducted by Andres Alonso and Jose Manual Marques, modern day transformation in financial sector is governed by introduction of the variable “sustainability” and highlighted innovation towards sustainable finance as: (Alonso & Marqués, 2019)

Figure 1.1: Innovation towards sustainable finance



IMO has brought several regulations for decarbonization of shipping industry, which has resulted on financial burden on the industry. As the companies will be required to either invest in improving existing ships or purchase new one which comply with the regulations, but will require significant capital, thus disturbing the short- and long-term budget. (Caschili & Meda, 2012) Economies of scale is a popular concept which explain the advantages of having large scale operations. In case of shipping, higher the fleet size, higher will be the efficiency and competitiveness of the company as it will be able to offer better freight rates and earn higher margin of profits.

Figure 1.2: Funding requirements for shipping sector



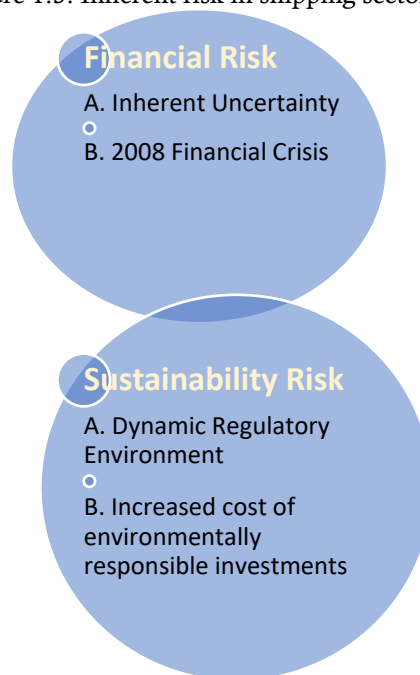
Shipping is a high risk and high capital industry; hence its funding requirements will be high at the same time challenging to raise funds. Owing to its fluctuating nature, it is rather difficult to get easy and quick funding from equity and hence major financing is done through banks. Banks are the major providers of funds to shipping industry in the form of debt, as observed specifically for bulk shipping companies. (Ioannidis, 2021)

Raising funds is critical for shipping companies for various reasons. Historically bank debts have been the most suitable for of finance for shipping companies. Off late private and public equity are also gaining flavors, but with condition applied with all other risk, another emerging area is ESG. In recent past ESG innovation, along with long term value for clients and shareholders is a dominant criterion for investors' portfolios and fund division. (Pangalos, 2023)

Challenges in Ship Financing and Green Shipping

Without environmental considerations also ship financing has been a challenging task for the shipping industry especially since 2008 financial crisis. The Basel criteria brought bigger challenges for banks and they lost their status of dominant provider of capital to the shipping industry. Adding to the concerns, the uncertainties and extreme risks brought up by Covid19 pandemic worsened the situation. Investing in green technologies invites a big upfront cost for shipowners, meaning shipping companies may be reluctant to invest out of fear of a short-term competitive disadvantage in case they are the first/sole movers in this direction. Shipping finance is turning out to be more complex as banks that dominated this market have substantially restricted their shipping related portfolios.(Papachristout, 2023; Shipping Law News, 2020)

Figure 1.3: Inherent risk in shipping sector



European Investment Bank's financing support for green shipping:

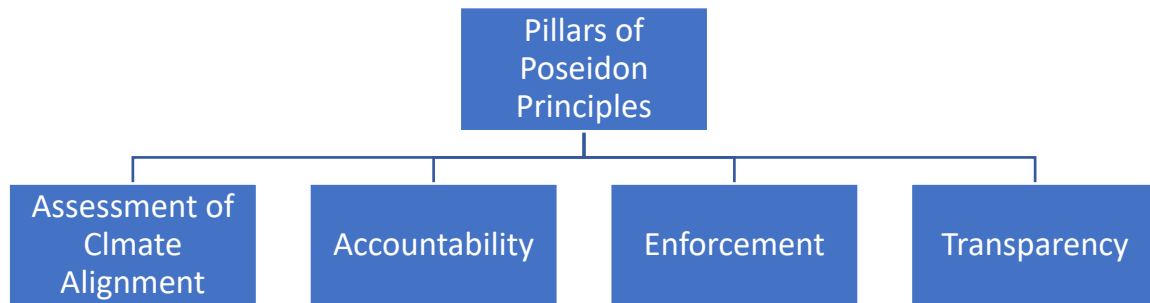
1. Loan programme for large shipping companies
2. Green Shipping Programme (Under European Fund umbrella)
3. New financial instruments to further support green shipping investments including Green Shipping Guarantee Programme (Under the Connecting Europe Facility) (Rebelo, 2020)

In order to address the growing concerns over financing in shipping industry, an important financial initiative by EU is to mobilize EUR750 million for encouraging investments in greener ships and updating the existing ships under the name Green Shipping Financing Programme. This initiative is addressing the credit risk of shipping related bank loans. (Bank, 2016) Through this programme EIB will support commercial banks as co-financer.

Collaborative and Joint Responsibility through Poseidon Principles

A revolutionary new green finance initiative, "Poseidon Principles" shaped up in the year 2019 when 11 international credit-financial organizations, agreed to a set of policy which will boost responsible funding for shipping industry. These principles which are in line with policies of IMO, are a framework for quantitatively checking and ensuring that the financial institutions' ship finance portfolios are as per the climate targets agreed by the International Maritime Organization.(Bhat & Mitchell, 2021) As per Poseidon principles 2023 annual disclosure report 34 leading banks have come forward and committed to Poseidon principles, jointly representing a bank loan portfolio to global shipping of approximately USD 240 billion.(Principles, 2023)

Figure 1.4: Poseidon principles structure



The Principles are consistent with the policies and ambitions of the International Maritime Organization (“IMO”), including its ambition for greenhouse gas (“GHG”) emissions to peak as soon as possible and to reduce shipping’s total annual GHG emissions to net zero by or around 2050 compared to 2008. In September 2023, signatories unanimously decided to align methodology with this ambitious outcome during MEPC 80.

Revolutionary Innovation by way of Green Corridors

Shipping route when developed and utilised for some specific objective or with some pre-determined ideology is referred to as corridor. A shipping corridor is essentially a shipping route between two important destination ports, on which the technological, economic and regulatory feasibility of the operation of zero emission ships are catalysed through public and private actions, offers the opportunity to accelerate progress in tackling the challenges of decarbonize shipping.

Green shipping corridors can be referred to as international special economic zones in a way that the entire green maritime ecosystems support the business objectives without adversely impacting the environment.

Innovation through collaboration

With the broader objective of decarbonization in shipping, shipping corridors can address several segments and achieve the objective of decarbonization.(ABS, 2022)

Figure 1.5: Component advantage of shipping corridors

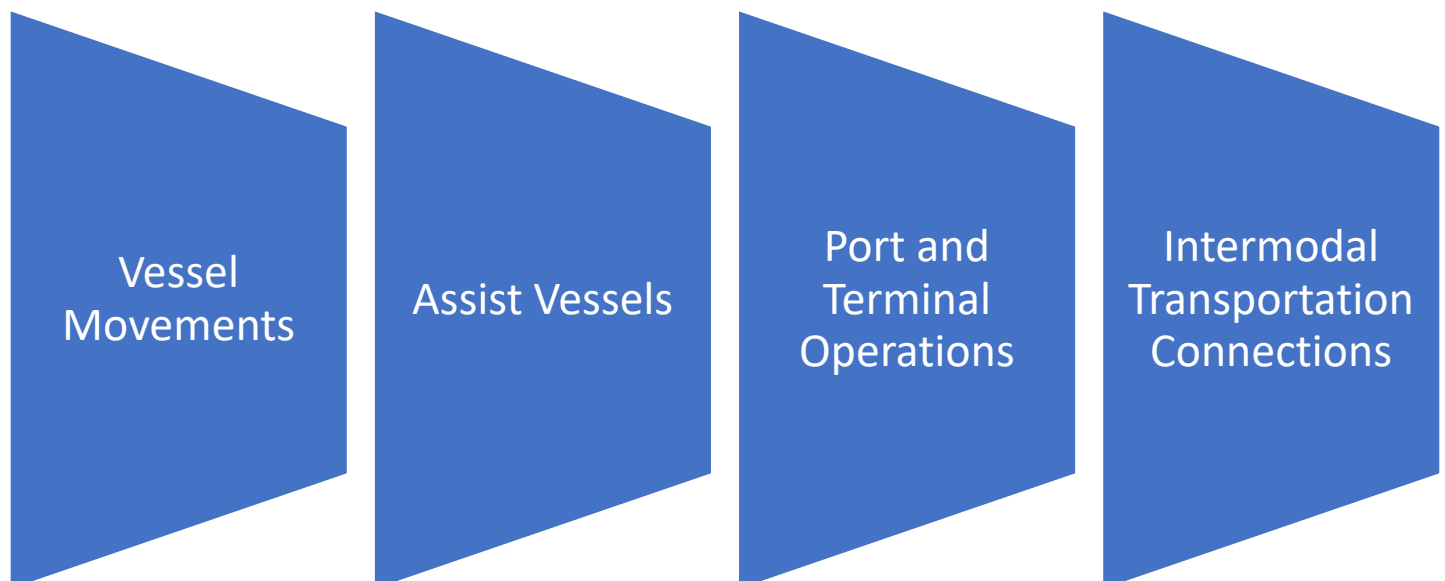
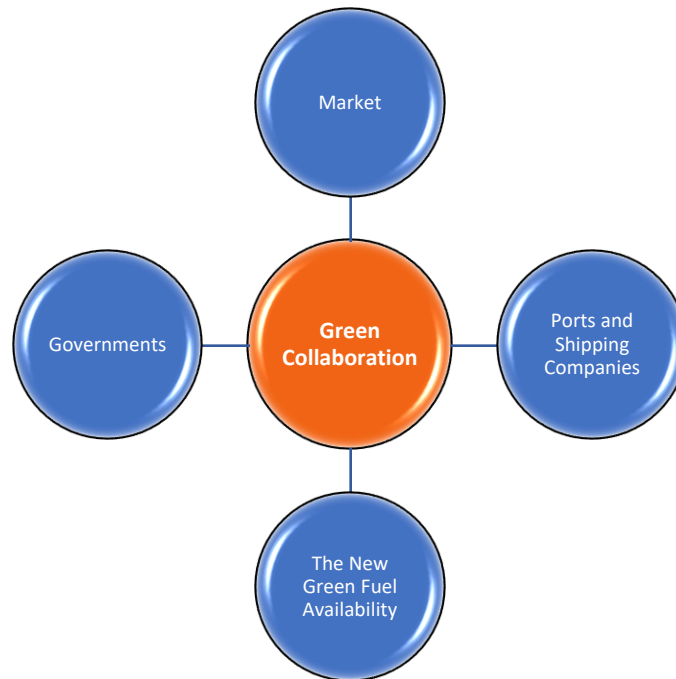


Figure 1.6: The collaborative advantage through shipping corridor



Examples of Corridor Under Development(ABS, 2022)

- Gulf of Mexico Green Shipping Corridor

Conceptual Green Corridor

- LA Shanghai Green Shipping Corridor
- Australia Japan Iron Ore Green Corridor
- Rotterdam Singapore Green Corridor
- European Green Corridor Network
- Chilean Green Corridor Network

Collaborative and Strategic approach towards decarbonization

There are several organizations globally who have taken lead for decarbonization in shipping, some of them are:

1. International Maritime Organization
2. International Chamber of Shipping
3. Global Maritime Forum
4. Getting to Zero Coalition
5. World Economic Forum
6. Smart Green Shipping Alliance

For addressing climate change and impacts, United Nation's agency, International Maritime Organization (IMO) acts as per UN Sustainable Development Goal (SDG) 13 to address issues related to emissions. IMO has devised a strategy for the time period from 2023 to 2030 with an objective to significantly decrease the GHG emissions from international shipping. The aim of the strategy is to substantially reduce the emission from shipping by at least 50% by the year 2050, compared to the levels of the year 2008. The ultimate aim is to phase out the total emissions eventually. Now the ball is in the court of international shipping companies to respond to the strict emission targets set by IMO. Following policy initiatives will provide detailed outline of the policy: (IMO, 2022)

- ❖ International convention for the prevention of pollution from ships (MARPOL) includes regulations aimed at preventing and minimizing pollution from ships – both accidental pollution and that from routine operations.

❖ Important initiative through MARPOL, Energy Efficiency Design Index (EEDI), was introduced in 2001 for achieving lower levels of CO₂ emissions for new ships through technical improvements. EEDI fixed the target of a 10% reduction of CO₂ levels (grams of CO₂ per tonne mile) by 2015, 20% by 2020 and 30% by 2025.

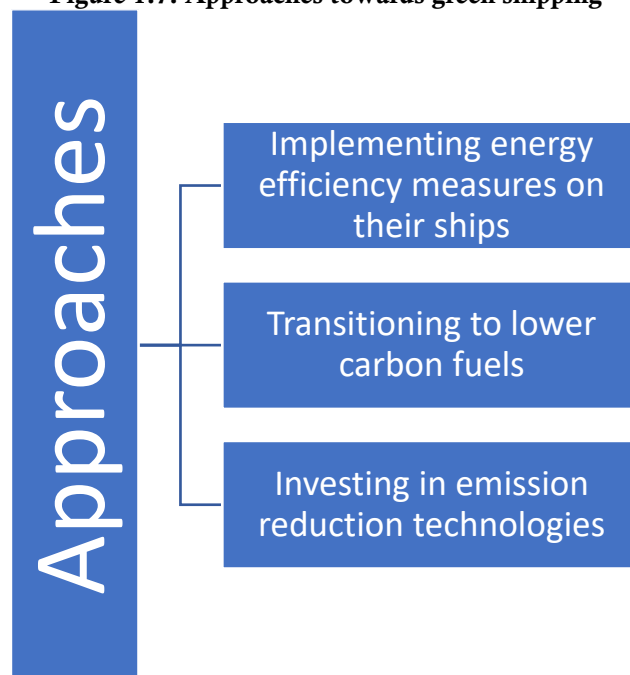
❖ The Ship Energy Efficiency Management Plan (SEEMP) was also introduced into MARPOL, for ships, for improving fuel efficiency through operational improvements.

❖ From January 2023 it is compulsory for all the ships to calculate their attained Energy Efficiency Existing Ship Index (EEXI) to measure their energy efficiency and to initiate the collection of data for the reporting of their annual operational carbon intensity indicator (CII) and CII rating.

Shipping companies for a Disciplined approach

Due to smaller profitability for shipping companies, changing in external environment and increasing regulations, shipping companies are compelled to think and act in the direction of using a greener ship. Considering various IMO regulations for shipping companies for environmental protection and reducing emissions, shipping companies can approach it in three different ways:(Pangalos, 2023)

Figure 1.7: Approaches towards green shipping



The undecided state of the marine fuel market and the numerous possible low / zero carbon fuel pathways creates an uncertain investment environment. There are several marine fuels which are at different stage of being adopted as ship fuel, which includes hydrogen, LNG, ammonia, HSFO, LSMGO, etc

1. Among several choices, hydrogen-based e-fuels – ammonia is seen as most economic option
2. Technological and operational measures for increasing the energy efficiency of ships
 - A. Speed Reduction
 - B. Ballast Water Treatment System is a system which will ensure that harmful aquatic organisms present in the ballast water will be killed or removed before water being released. This will ensure that the invasive species will not be introduced in the new ecosystems and proactively avoid harming the environment.
 - C. Exhaust Gas Cleaning System, also known as scrubber will ensure that harmful elements like sulfur oxide, particulate matter, etc present in the exhaust gas from the ships are removed before they are harming the environment.
 - D. Alternative Marine Power will ensure that vessels will utilize power source from terminals while they are docked. This will avoid them to run their engines and ultimately reduce pollution in port areas.(Balcombe et al., 2019)

CONCLUSION

Rationale for need of innovation and collaborations

A. Fragmented and overlapping regimes with respect to frameworks to decrease GHG from vessels, such as from US and EU, leads to increased complications for international shipping. (Piccolo, 2023)

B. Alternative fuels are a great idea for reducing emissions, although from few options, singling out one best alternative should happen soon, but the IMO's regulations are on a 'tank-to-wake' basis, as emissions from energy supply chain are not considered, but is confined to the direct fuel utilized by ship. (Opinion Lloyd's List, 2023)
(above problem is addressed by revised guidelines 2023 IMO GHG Strategy)

C. Shipping industry is highly capital intensive on account of increasing amount of investments required in ships and recently the entry barrier has further strengthened due to increased regulations. (Romano & Yang, 2021; Schinas & Bergmann, 2021)

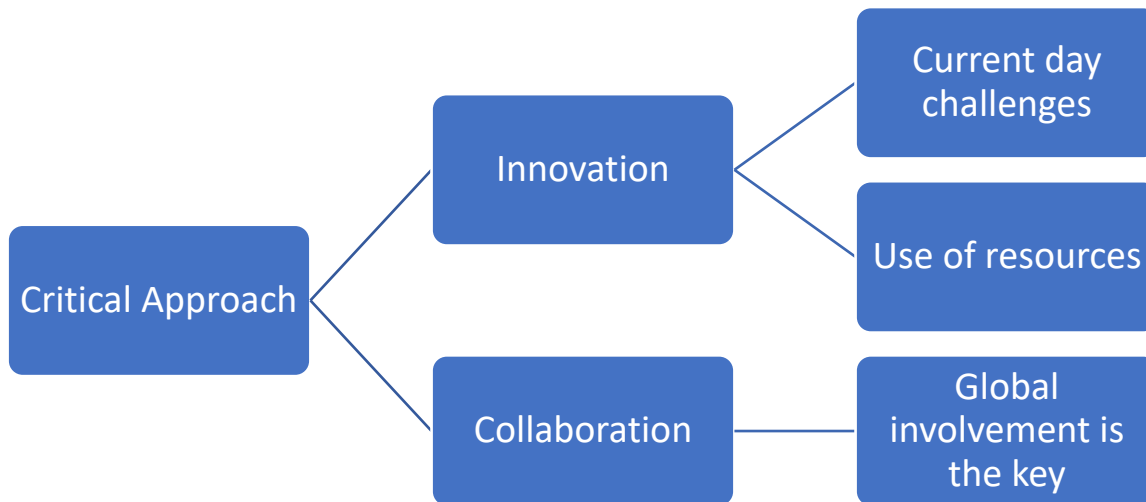
D. Present policy instruments are insufficient to support the decarbonization challenge. The lack of economic instruments, lack of innovation and absence of implementing alternative propulsion technologies needs to be addressed. (Bach & Hansen, 2023)

E. Current policy of IMO is ineffective due to its lack of capacity to regulate technologies, by way of regulating new fuel, lack of capacity for bringing the political consensus, etc (Bach & Hansen, 2023)

Why Innovation: As the problem is grave and no single country, technology, regulations, policy, strategy can solve this. Hence a fresh, new, creative approach is essential.

Why Collaboration: As global warming is already an international phenomenon, no single country or a group of countries can address this on its own. Global shipping is truly a global industry, hence several countries, companies, organizations have to truly lead a unified action.

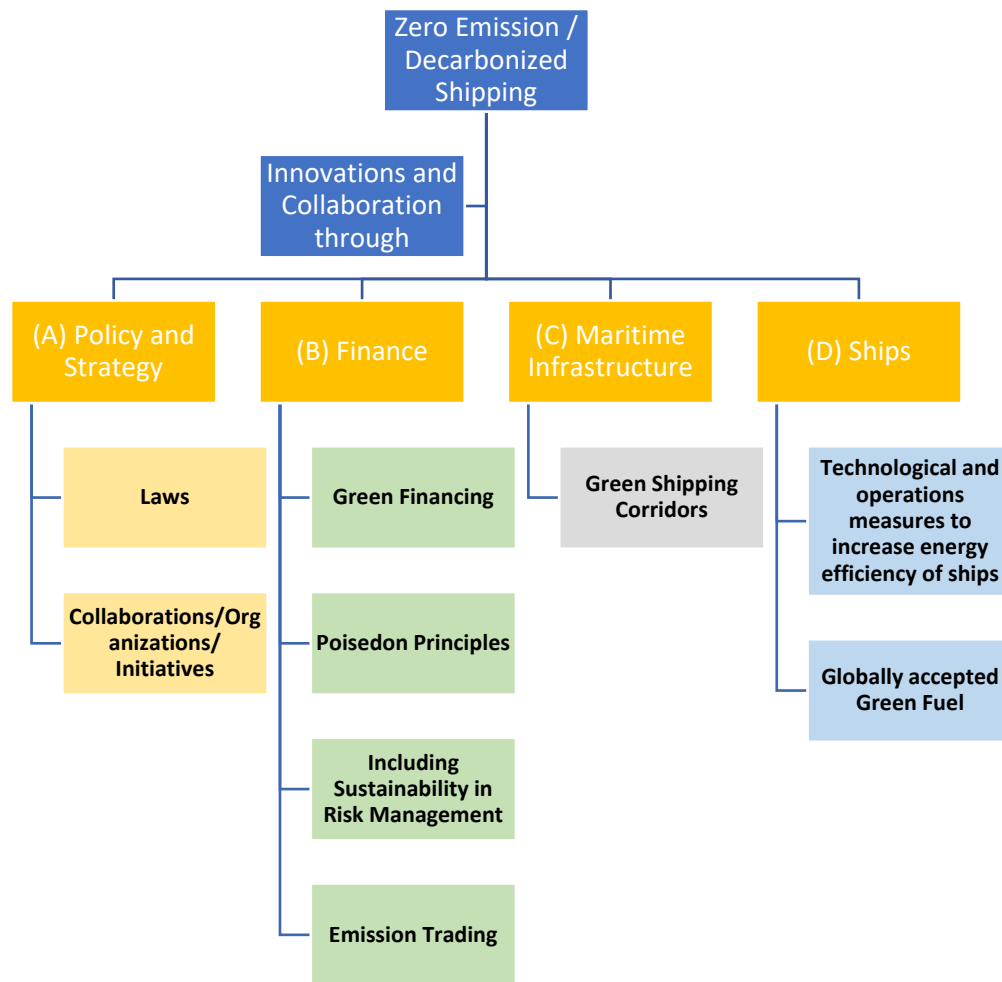
Figure 1.8: The global critical approach to address climate change



Environmental and thereby regulatory disruptions along with economic uncertainty on account of shipping cycles compel shipping companies to devise strategies which will help them become relevant and sustainable in long term.

Due to high uncertainty of the industry which is influenced by geo political, environmental and economic factors, it is quite challenging to maintain the financial performance. With ever increasing global trade leading to increased demand of global shipping, the utilization of international maritime transportation is inevitable. But shipping activity is causing negative impact on environment in more than one ways and hence it is important to address. Although least polluting, shipping can potentially contribute to increasing emission in coming times. To tackle this impending challenge, this research paper has conceptualized the relation between emissions due to international maritime transportation and the sustainable solution through innovation and collaboration in four areas: (A) Policy and Strategy (B) Finance (C) Maritime Infrastructure (D) Ships

Figure 1.9: PFMS - Proactive approach to climate change



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