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Climate Change Mitigation and Environmental Governance: Maritime and Air Pollution Perspectives Highlighting China's Initiatives

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Abstract

The phenomenon of climate change has been prevalent since ancient times. There is ample evidence that climate change affects human health detrimentally and is grossly damaging to the human life. Climate change is causing the immense destruction of life in multifarious ways. Despite scientific advancements, marine living and non-living resources are being depleted, and the marine environment is suffering in numerous ways, such as maritime crime, acidification, and greenhouse gas emissions. Climate change is having a profound impact on the socio-economic fabric of society, and the policy stances being adopted by states are inconsistent. Immediate action must be taken by the world maritime community through rational policies to overcome vulnerabilities of the oceans caused by climate change. Stringent compliance with laws designed to combat climate change on the maritime front must be enforced. The present article purports to address climate change mitigation efforts. A tangential focus on Chinese initiatives regarding climate change is presented. It is envisaged that co-operation between public and private interests will serve to combat climate change and promote global sustainability.

Keywords: *Climate Change, Marine Environment, Environmental Protection Law, Pollution, Mitigation, Sustainability*

1. Introduction

Climate change is a significant global issue. It has direct and indirect impacts on both marine and coastal ecosystems. As such, the maritime sector is suffering on various fronts including the shipping industry and seafaring as a profession and vocation. The context of climate change has multifarious socio-economic impacts which stretch across the environment both on land and at sea. It has become a serious threat to sustainable development for future generations. There is, therefore, a need for the world community at large to clearly comprehend its adverse effects, and act to mitigate them. With regard to the marine environment, the effects of climate change sweep across issues relating to, *inter alia*, temperature increase, rising sea levels, and ocean acidification. These impacts influence the cultures, livelihoods, and dietary habits of people. Climate change has thus emerged as a profound problem confronting humanity in the present era.

The oceans, which cover 70% of the planet's surface, drive the biosphere and our climate. The *Fifth Assessment Report* of 2014 revealed that climate change has affected all continents and oceans, and Greenhouse gas (GHG) emissions constitute its largest part. Changes in the ecosystem

have serious implications for global food production. Therefore, the world community at large has realized the need for environmental protection. As may be expected, the most developed countries have implemented green innovation policies. Despite this, the common problem in climate change governance for environmental protection activities is the absence of proper coordination and collaboration.

In this light, the main focus of the present article is on China which has rapidly advanced as an emerging industrial powerhouse and made substantial achievements. Yet on the flipside, China has also contributed immensely to environmental pollution at different levels. As such, sound planning strategies and the development of a suitable legal regime for environmental governance are necessary for China to respond and adapt to the changing climate scenario. In this respect, several studies conducted in China have revealed problems pertaining to law enforcement.

Against the above background, the object and purpose of the present article is to -

1. analyze the link between climate change and international fisheries disputes and identify major gaps in efforts to protect the oceans;
2. present China's air pollution crisis and its consequences emanating from the severity of climate change;
3. consider environmental regulation and green innovation industries as a solution for optimal decision-making; and
4. present responses to climate change in terms of multi-level governance theory.

2. Climate Change and Fisheries

Various environmental issues give rise to regulatory and administrative pressures on national and international authorities. Climate change vulnerabilities have negative impacts on the local communities, and the degree of vulnerability varies based on their capabilities to adapt. In the case of natural hazards, their socio-economic capacity has a long-term impact on climate change. Developed countries are less sensitive and more adaptable to changes due to their technological and financial capabilities and stability. It has been observed that climate change and maritime vulnerability go hand in hand. Unfortunately, the phenomenon of climate change has, perhaps inadvertently, espoused criminal behaviour in the maritime field, much of which is attributable to poverty and its detrimental effects on human health and food security, particularly fisheries.

When it comes to fisheries resources, the impacts caused by climate change vulnerabilities are not evenly distributed. This has been reported in the fifth assessment report presented by the IPCC, which points to a significant relationship between climate change and maritime criminal activities in specific areas attributable supposedly to widespread poverty threatening the well-being of the world community at large. No doubt, concern over fisheries is an important aspect of the impact of climate change which attracts analytical consideration. Unlawful fishing activities, evolving changes in fish species, and inefficient management exemplify undesirable behaviour and events that may ultimately lead to climate change. Unbecoming conduct also threatens human security where human trafficking and other illegal activities that amount to criminal acts are facilitated. Climate change causes problems for local communities, creating untold pressure on their livelihoods. This potentially leads to criminal activities being committed by them. Incidentally, however, not everything illegal or unlawful is necessarily criminal in nature or scope in legal terms.

For example, overfishing in a specified maritime zone may be illegal and attract regulatory sanctions. However, it may not constitute a criminal offence even though there is unmistakably a connection between the two.

As some scholars have pointed out, the phenomenon of climate change has a strong correlation with maritime activities that are illegal or unlawful, or even criminal in nature, which in turn adversely impacts the socioeconomic standing of many communities, as shown in Figure 1.

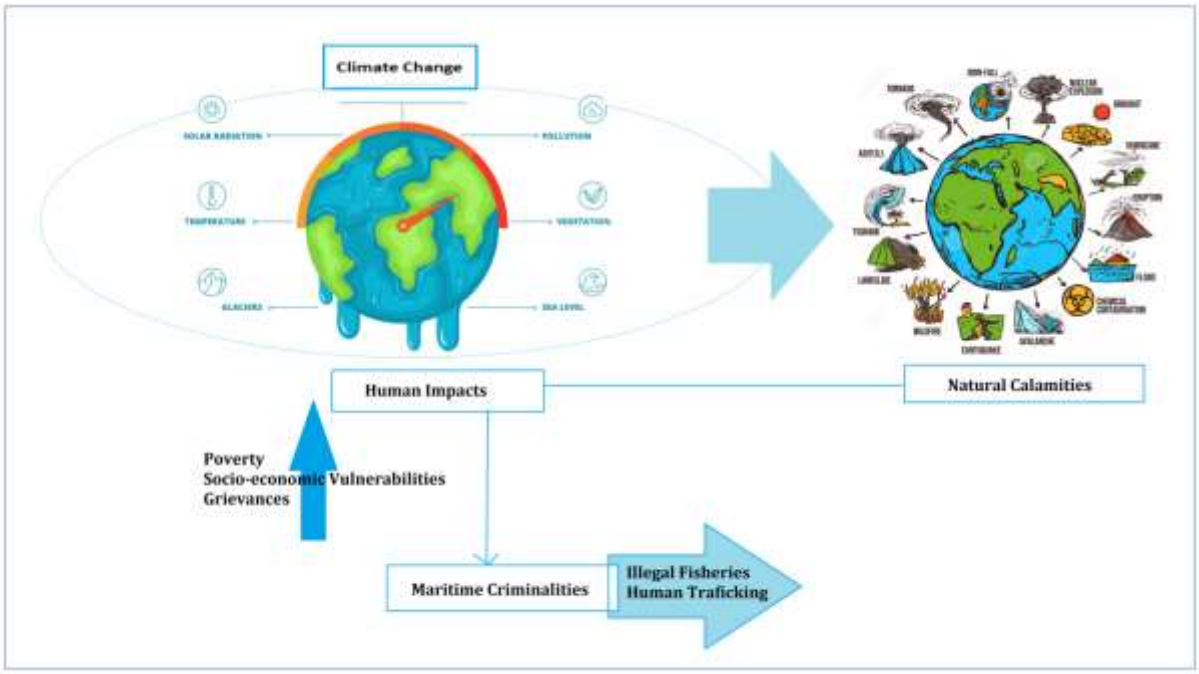

Figure 1 Climate Change and Maritime Criminality: Source [Author's contribution]

Figure 1 depicting the correlation between climate change and maritime criminal behaviour is self-explanatory. There can be no doubt that, climate change entails new challenges for the fisheries. It causes rising sea levels, ocean acidification, and temperature increase, all of which in effect create new risks and problems for fisheries management arising from negative impacts on fisheries and fish populations. It is thus necessary to take prompt initiatives to scale up decarbonization and to systematically minimize greenhouse gas emissions in order for the maritime protection.

Ocean warming changes the yields of marine species. Ocean acidification reduces fish species and alters productivity and fish stocks. The rise in sea levels causes global coastal lines to break. This, in turn, causes scarcity and a reduction in supply. The demand for fish products grows as the population increases. Despite the food system being supported by aquaculture, there is still a considerable amount of complexity involved. Another challenge is that ocean acidification contributes to the change in fish productivity. It causes a serious threat to marine species due to algae- domination prevailing in certain countries. Acidity reduces the ability of corals to survive, thereby reducing the extent of fish habitat areas. This consequently affects the economy and food production which has been observed in the Canadian province of British Columbia and several

European countries. Ocean acidification apparently leads to conflicts among countries over resource allocation.

Many species in history have left evidence of their negative impacts. Countries are vulnerable to climate change as they transit to new livelihoods. Although predicting the overall global impact of fisheries is difficult, climate change has serious consequences for reduced fisheries and increased scarcity. However, agreements such as the Central Arctic Ocean Fisheries Agreement have agreed on a 16-year moratorium for commercial fishing in the Artic Sea, benefiting nine major states. Also, commercial fishing in Antarctica is permitted through the Convention for Conservation of Antarctic Marine Living Resources. Furthermore, new management approaches are being adopted in international fishing management to combat the ill-effects of climate change. However, since there is no single solution to the problem, it is necessary to implement flexible and responsive policies. If this is done soundly and rationally, marine protection can be achieved and poverty and inequality can come to an end.

The following section addresses the major gaps identified in the ocean protection effort. It is submitted that by protecting the oceans, inequality and poverty can be eradicated. Undoubtedly, increases in maritime production can yield more job opportunities for people.

3. Gaps Identified in the Ocean Protection Effort

The functioning of the oceans is essential for life on planet Earth. Oceans suffer degradation due to deoxygenation, increased acidification, and carbon dioxide (CO_2). It is evident from the relevant literature that the various gaps identified with regard to ocean protection efforts include the following:

(1) the lack of policy implementation addressing climate change;
(2) the need for effective monitoring of marine resource protection, such as the high seas and fish habitats;
(3) making informed decisions and taking precautionary measures for deep sea mining;
(4) raising awareness about reducing illegal fishing, human trafficking and other related criminal activities; and
(5) the lack of funding and control over marine plastic pollution.

Researchers have identified increased carbon dioxide and methane levels as causing ocean acidification and warming. Governance with a strong focus on climate change remains a challenge. Even the deep sea is not an exception. Studies should be made on how heat absorption from the sea to the atmosphere affects monsoon cycles. High seas cover 61% of the ocean (Coenen, *et al*., 2021). Affordable technology and proper governance are needed in the high seas and the deep seabed, known in UNCLOS as the "Area" for deep-sea mining activities. In this regard, the International Seabed Authority (ISA) and International Maritime Organization (IMO) should coordinate in protecting maritime biodiversity. Maintaining the structure of the maritime ecosystem and improving its resilience through law enforcement is essential. Increased marine areas are needed and should be managed according to the highest standards for climate change mitigation. High seas marine protected areas are protected with a range of new technologies,

including satellite surveillance, onboard surveillance, and electronic log books through the Port State Measures Agreement, which provides tools to effectively implement at protected areas.

Funding mechanisms for implementing envisaged actions to protect the maritime ecosystem are presently inadequate. Therefore, addressing the ocean crisis is necessary as it damages the life support system on the planet. Given the importance of the ocean, human life relies on its benefits. The gaps identified here point to the need for cross-cutting measures to combat climate change. Cross-cutting issues correspond to the problems addressed in the Convention's substantive provisions in Articles 6-20, and provide bridges and links between the thematic programmes. Action should be taken forthwith to ensure the health of the oceans for future generations. By adopting the Paris Agreement of 2015 countries should help to keep global warming to an average increase of less than 2^{o}C, which in turn will prevent the ill-effects of climate change (Guo *et al.*, 2019). National governments have increased their strategies for climate change mitigation in respect of which, it is essential to understand the contributions of each country. Policies related to climate change mitigation are examined in the next section of the article to address this matter.

A relevant observation is that the carefully implemented Chinese Carbon Capture Technology policy resulted in a 50% reduction in CO_2 emissions by 2020 compared with the level in 2005. The policy has also promoted the construction of so-called "zero-energy consumption" buildings by introducing new guidelines. This makes it apparent that China has put in place an ambitious long-term policy for reducing environmental pollution.

3. China's Air Pollution Crisis and its Severe Impact on Climate Change

In the past forty years, China has experienced rapid economic growth. The improvement in the living standards of Chinese people has changed the environment as well. At present, the Chinese government is seeking a sustainable model which includes low carbon emissions, financial development, and technological innovation promoting environmental protection. China is one of the highest carbon-emitting countries in the world. It is apparent that to control CO_2 emissions for sustainable development, radical law and policy changes are required. Researchers in China have observed the negative effects of CO_2 emissions as a significant factor in climate change.

China's CO_2 emissions have a severe negative impact on global climate change (Guan *et al.*, 2018). This indicates that China's air pollution crisis has ill-effects on human health and the environment. Many policy initiatives have been considered to control and maintain air quality. In many developing countries, air pollution has been the cause of many diseases. A report by the Lancet Commission on Pollution pointed out that more than nine million people die globally due to various infectious diseases. Decades of industrial growth have produced the negativity of unhealthy air. Air pollution is associated with emissions of GHG which has profound implications for climate change. In southern China, a pollution war was declared in 2014, as a result of which several environmental policy initiatives have been implemented. Unfortunately, the approach has been to pollute first and clean up later.

As an economic powers house, China has also become the biggest consumer of coal, steel, and oil, causing enormous amounts of CO_2 emissions. The Ministry of Ecology and Environment was established in 2018 to promote and enhance environmental protection. However, exposure to fine

particles with sizes less than 2.5 mm continues to increase the risk of mortality rates. Needless to say, the impacts of air pollution are causing complex negative health outcomes as shown in Figure 2 below.

Figure 2 Air Pollution in China, 2018

[Sources: Beijing, China Jan 25th, 2018, The Economist/2018/01/25]

Air pollution levels vary across regions, and densely populated areas have severe chronic pollution (Wang *et al.,* 2017). Recently, South Korean activists filed a lawsuit against Beijing, alleging that air pollution from China affects the health of their people. Many rural areas continue to use cars and trucks that do not meet emission standards. Similarly, factories lack environmental mitigation technologies, contributing to chronic ambient pollution. To comply with environmental regulations, Beijing closed its last coal plant (Feng, & Hao., 2017). In 2014, due to intolerable air pollution, a red alert was given for school closings and residents were advised to remain indoors. Following this event, amendments were passed to the 1989 Environmental Protection Law which concomitantly addressed the gap. Measures taken included the arrest and detention of factory owners who did not comply with the emission standards. Systematic monitoring was developed to support better pollution control. The new Ministry of Ecology and Environment was restructured in 2018, to consider both climate change and pollution mitigation. Thus, a low-carbon development strategy was implemented to improve the country's environment and reduce pollution.

Around 80% of global trade is estimated to depend on international shipping. Compared with other transport shipping emissions are a significant contributor to global impacts. There are approximately 52,000 ships engaged in international trade. These are propelled by over 500 GW of engine capacity. In the CO_2 emission report of 2007 (Fekete *et al.,* 2021), it was mentioned that 2.7% of the global CO_2 emissions are attributable to international shipping which is forecasted to increase by 50% by 2050. At present, the International Maritime Organization (IMO) is working

on the regulation of GHG emissions as dictated by Article 2(2) of the Kyoto Protocol (Fekete et al., 2021). This matter is also addressed in the United Nations Convention on the Law of the Sea (UNCLOS). *1833 UNTS 3*.

The Marine Environment Protection Committee (MEPC) of the IMO stated that technical, operational, and market measures are provided in the form of amendments to Annex VI of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 and other Protocols, (MARPOL 73/78). *1340 UNTS 61; UNTS 3; 1341 UNTS 3.*

In 2011 and 2014, IMO took measures through its Resolutions (Wang *et al.,* 2019) to reduce fuel consumption for reducing GHG emissions from ships using Energy Efficiency Operational Indicator (EEOI) for monitoring compliance. International shipping undoubtedly plays an indispensable role in combatting climate change.

3.1 Reduction of Air Pollution in China

The Chinese government launched an initiative to reduce fine particle pollution. The smallest polluting particles, PM 2.5, were seen across 26 cities in North China (Cook, 2020). Since 2013, China has practiced anti-pollution measures as part of its national action plan. By 2018, Beijing had reduced 50% of its coal consumption. New coal plants were banned. In its 2021 review, remarkable reductions in air pollution since 2018 were reported (Wang *et al.*, 2019). The primary strategy was the introduction of zero-emission new energy vehicles. The Clean Air Plan 2035 for Hong Kong has several objectives for meeting WHO standards. The New Air Pollution Prevention and Control Law as revised by the National People's Congress, will be fully effectuated. This was the first Chinese law to control GHG. The Law ensures that local government will comply with the concrete plans for meeting the air quality targets. The planning process will be open and transparent, allowing for public input. Both public and government agencies will supervise the implementation of those measures that do not meet the quality targets. Local leaders need to develop a correction plan and explain new projects for controlling air pollution. Another significant control measure is limiting local coal consumption, followed by improvements in vehicle fuel efficiency. Aside from implementing the law, public participation also has a major role in environmental protection. The law encourages more use of public transportation and low-emission vehicles. Seizure and containment of facilities and equipment have been carried out to control severe pollution.

The law contains seven chapters with 66 articles and eight chapters with 129 chapters. Although China is an international leader in environmental protection, it continues to diligently address the impacts of climate change and improve its control measures. As a party to the Paris Agreement on Climate Change, since 2014, it has been committed to reducing carbon emissions over five years. The government has recently released the China Standard 2035, encouraging climate neutrality and environmental protection. The Taizhou case, in which individuals were sentenced for dumping hazardous waste into China's rivers, has received widespread attention. The National Green Development Fund encouraged investments across China to build a green economy. International buyers were forced to comply with green policies. Multinational companies have adopted green supply chains. A few businesses were forced out of the market due to the new regulations (D.

Narita, K. Rehdanz, 2017). Also, cross-border pollution issues were addressed in collaboration with the United States Environmental Protection Agency.

In 2018, China's State Council released a 3-year plan to improve air quality. The plan aims to cut SO_2 and NO_2 emissions (Sovacool, 2021). The National Development and Reform Commission addressed climate change issues. The major national laws are the Environmental Protection Law (2015), the Air Pollution Prevention and Control Law (2015), the Environmental Impact Assessment Law (2003), the Law on Promoting Clean Production (2012), and the Energy Conservation Law (2007). It is important to note that the Air Pollution Prevention and Control Law has followed a long path to become the principal guidin. (Tilt, 2019). Despite the constraints, the updated law marks a considerable step forward. In China, how a law is enforced is much more important than how it looks on paper. A lack of good legislation is not the cause of China's ecological crisis, but rather a failure by the government to prioritize the environment and enforce the laws effectively, is responsible for diluting China's hope for clean air (Balcombe *et al.,* 2019). Technical and operational measures are insufficient to address the emission reduction in shipping. It necessitates the adoption of values that the majority of states can find desirable.

3.2 The Maritime Dimension

As the maritime industry expands, strict regulation will be needed to reduce emissions and improve productivity (Bos, & Gupta, 2019). Therefore, developing a regulatory framework is essential for the marine environment, as discussed in the following section. Additionally, since non-party state ships are exempt from the Energy Efficiency Design Index (EEDI) provided in MARPOL Annex VI, global port-state control (PSC) devices will help to verify that these ships abide by the regulations. The 2011 revisions to MARPOL Annex VI mandate that port states must confirm that all ships calling at their ports are in possession of an "International Energy Efficiency Certificate." However, certain nations, including Brazil, China, and others, voted against Regulation 138. This presents a problem for the execution of any novel ideas in the future. Regardless of principles, addressing global climate change in the international shipping sector remains a challenge.

4. Environmental Regulation and Green Innovation for Optimal Decision-Making

The principal objective of worldwide businesses and governments is a desire for sustainable development. Though businesses have strong competitiveness, they are scrutinized for their adoption of strategies for environmental regulation. China's Environmental Protection Law was enacted on January 1, 2015 (Liu *et al*., 2021). Industries that do not follow environmental protection standards are affected by this law. Economic development is difficult to maintain globally if the environment is ignored. Since 1978, China's economic development has increased rapidly. However, waste gas emissions and solid waste produced by industries have been increasing in recent years (Liu *et al*. 2020). The law highlights both public participation and liability for damage. Various reforms were introduced in the new law. (Zhang *et al.* 2020): In Article 58, it is mentioned that any social organization registered with the Civil Affairs Department engaged in public welfare and environmental protection activities can file a lawsuit against firms that are involved in damaging the environment illegally (Hoegh-Guldberg *et al.,* 2019). Another feature is that environmental quality is assessed during the government's tenure, and polluters are

held accountable. Article 60 refers to the shutdown operation carried out by local environmental agencies in the event of a violation. Article 55 requires high-polluting industries to disclose to the public the operation of pollution prevention and control facilities as well as specific environmental information such as categories of pollutants and emission levels. Article 59 provides for a daily penalty.

For organizations to have social influence, they must maintain goodwill and legality. Environmental innovation-based strategies may be caused by governmental and non-governmental pressures (Lee, 2019). Under the new law, government officials are accountable. Any industry entity can file a lawsuit in the public interest. Industry entities that cause serious pollution emissions face huge penalties. They are thus compelled to comply with laws and practices that reduce environmental pollution and adopt green technology or risk losing their business (Chen, & Gong, 2021). Additionally, the use of green technology reduces emissions and raw material consumption. (Song *et al*., 2020; Tang *et al*., 2018).

The majority of corporate decisions are in line with public interruptions. In China, state-level governance structures differ from those in the private industry. Their goals in terms of profit maximization and economic responsibility vary considerably as green technology benefits the public rather than the individual. It is an act that contributes to societal welfare (Kumagai *et al*., 2018). Provincial government officials are expected to take strict measures to ensure that no environmentally damaging conduct prevails as it may jeopardize their promotions. According to a study conducted by Liu *et al*. (2020), it is evident that the degree to which industries are affected varies when it comes to the new Environmental Protection Law. Empirical results show that the new law promotes green innovation, especially in the case of state-level industries as compared with private industries. (Muganyi *et al*., 2021).

5. Climate Change in Terms of Multi-level Governance Theory

Looking back at the history of governance since 1940, it is clear that corporations and unions, needed new forms of management, which, by 1980, had gained influence in various departmental processes. But an inability to materialize privatization, globalization and state welfare was perceived. The ordered rules were used to implement governance. Climate-change disasters pose a threat to all countries. Many negative impacts are seen in developing countries that face restrictions on financial and other resources (Redgwell, 2019). These countries also need to cope with natural disasters that can slow down GDP growth (Westman *et al*., 2019). It is apparent that climate change impacts fiscal consequences. Thus, governance becomes a complex process involving the formulation, promotion, and realization of common goals.

The notion of multi-level governance emerged in Europe during the 1990s. It consists of negotiation and competency at different levels of municipal and central authorities among states and also non-state actors. Thus, multi-level governance is being used to interpret climate change politics. Multi-level governance involves a steering mechanism to increase the connectivity of various governments. It promotes climate change action by tackling complex issues through collaboration. It involves interaction across geographical borders and implements climate change solutions. It serves as a theoretical lens through which climate politics and its actions can be viewed.

Given that a semi-authoritarian political system operates in China, it imbibes the culture of ideological control generated by a single political party with economic freedom. Multi-level governance is an alternative to traditional governance. The governance theory explains political interactions. Over the past few years, there has been low carbon diffusion in various areas of China. For climate change mitigation, multi-level governance is pervasive. Globally, it is essential to solving international challenges. Traditionally, climate change governance entailed disparate actions forming a collaborative project to address related challenges (Bulkeley *et al.* 2014). This includes rule-making, adoption standards, and information sharing. It focuses on global regimes so that autonomous authorities are coordinated towards a common goal. It is the responsibility of both the public and private sectors to address climate change, and in that regard, action must be taken by the government and all sectors. They involve economic and industrial issues facilitating coordination and resource mobilization. For hybrid governance (government-sponsored entities with multistakeholder management, publicly financed corporations), new goals and responsibilities must be assigned (Aiken, 2016). However, these are associated with barriers to change, interests, and policy concerns. A networked structure has changed the way decisions are made raising concerns about equity, ability, and legitimacy. There are also influences on urban development from both economic and political stakeholders.

6. Conclusion

The vastness of the oceans can enable the adoption of several mitigation strategies to lower greenhouse gas emissions, develop a sustainable food system, and preserve the ecosystem. Initiatives to scale up decarbonization and systematically minimize greenhouse gas emissions are required. The international community plays a major role in controlling emissions, and rising temperature. The mitigating measures taken and those made public are examples of policy recommendations for promoting global sustainability. Such actions can enhance food security, increase employment opportunities, and support human health. It is the collective responsibility of all stakeholders. Strong leadership and rational policy formulation are needed to avoid a crisis caused by climate change. Economic investment in research and development is necessary to create the necessary principal legislation and regulatory instruments. Whatever is adopted, there are both beneficial and harmful effects. These risks and limitations must be addressed and dealt with in a reasonable manner. Technology advancements must support the oceans as a solution to climate change.

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