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Maritime sector has always been influencing the global economy. Shipping facilitates the bulk transportation of raw material, oil and gas products, food and manufactured goods across international borders. Shipping is truly global in nature and it can easily be said that without shipping, the intercontinental trade of commodities would come to a standstill.

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MARINE POLLUTION AND SDG 14 IMPLEMENTATION DEGREE OF CHALLENGES AND COMBAT STRATEGIES

Dr Jai Acharya[1]

Abstract

This literature review aims to highlight on current scenario and identify research needs related to the Sustainable Development Goals (SDGs) and to explore options for making structural changes in research policy and creating more resources to foster progress on the SDGs related to environmental issues, climate change, marine plastic litter and debris, ocean acidification, eutrophication and specifically Goal 14: Life Below Water. Marine pollution can have a wide range of impacts on ocean ecosystems, including damage to marine life, habitats, and food webs. The ocean provides important ecosystem services to society, but its health is in crisis due to the impacts of human activities. Ocean sustainability requires ambitious levels of scientific evidence to support governance and management of human activities that impact the ocean. However, due to the size, complexity and connectivity of the ocean, monitoring and data collection pre-supposes high investments, and nations need to cooperate to deliver the ambitious, costly science that is required to inform decisions (Ref: Atlantic Ocean Science Diplomacy in action - Andrei Polejack, Sigi Gruber et al.).

New challenges, including climate change and sea-level rise, plastics and microplastics, anthropogenic underwater noise, ocean warming, and ocean acidification, are more prominent. Plastics and microplastics in the marine environment have increased dramatically and are a serious threat with complex eco-toxicological effects (Avio et al., 2017). Carbon pollution is changing the ocean's chemistry making it more acidic. Ocean warming and acidification, although different phenomena, interact to the detriment of marine ecosystems, affecting primary productivity, nutrient cycles, and ultimately the survival of marine species. Anthropogenic underwater noise production has serious detrimental effects on ocean biodiversity (Williams et al., 2015). In 2015, the UN General Assembly adopted 17 Sustainable Development Goals (SDGs) as part of the 2030 Agenda. Most notably the SDG-14 - Life Below Water and Target 14.1 entails that by 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris & nutrient pollution.

[1] Principal Consultant – International Maritime Management & Consultancy (ORCID ID: 0000-0002-3186-6216) Singapore
Email: jaiacharya@gmail.com

Overall, marine pollution is closely linked to achievements of targets of SDG 14 and related to plastic waste and marine litter management across the sectors. Target 14.1 and associated indicators stress in particular the problem of plastic debris and nutrition pollution, linked to eutrophication.

SDG 14 targets seek to prevent and reduce marine pollution; further the sustainable management and protection of marine and coastal ecosystems; address the impacts of ocean acidification; regulate harvesting and end overfishing, illegal, unreported and unregulated (IUU) fishing and destructive fishing practices; conserve coastal and marine areas; increase the economic benefits to small island developing States and least developed countries from the sustainable use of marine resources; and strengthen the means of implementation, including increasing scientific knowledge, the transfer of marine technology and implementation of IMO Conventions on marine pollution prevention (MARPOL) and international law as reflected in the UN Convention on the Law of the Sea (UNCLOS) 1982. (Ref: Miguel De Serpa Soares https://un.org/en/chronicle/article).

While there are many uncertainties both in the scientific and policy realms, reality in the ocean is much more certain and paints a bleak picture that calls for urgent action. The evolution in ocean governance from Stockholm to SDG 14 has not altered the stakes, which remain as high as they can be - Ocean Health is Intimately Tied to Our Survival. To address this gap, a global overview on current progress in terms of achieving the success in implementation of SDG 14 and the degree of challenges due to marine pollutions has to be linked with precise strategies to combat the challenges.

Keywords: Marine Pollution, Marine Resources, Sustainable Development Goals, SDG, SDG 14, SDG 14 Targets, IMO, IUU, MARPOL, UNCLOS, UNEP, Life Below Water, Plastic Pollution, Ocean Statistics, Coastal eutrophication, Combat Strategies, Climate Change, Marine Protected Areas (MPAs), IUCN, UNFCCC.

1. PROLOGUE

Several of the interlinked SDGs are essential in relation to the ocean and seas and contain specific targets and timetables for achieving them. Goal 14 - 'Life Below Water'- addresses marine issues specifically SDG 14. This goal provides opportunities to both facilitate concrete actions for ocean sustainability and foster greater integration in ocean governance. Since the adoption of United Nations Sustainable Development Goals (SDGs) in 2015 global agenda. At the national level, the ocean has received increasing consideration, with many coastal states and islands adopting blue economy strategies and frameworks and putting the ocean at the centre of development.

SDG 14: Life Below Water includes ten targets, four of which (14.2, 14.4, 14.5 and 14.6) expired in 2020. It remains very high in the international agenda aligning with the UN Decade of Ocean

Science for Sustainable Development. As research has shown, the achievement of SDG 14 is a prerequisite to the achievement of other Sustainable Development Goals (SDGs). Globally, it has been found that SDG 14 is one of the most difficult goals to achieve (Salvia et al., 2019).

Despite the critical role of SDG 14, funding and research towards SDG 14 has also been limited (Johansen and Vestvik, 2020). Considering the current high profile of SDG 14 (UNEP, 2021), more research is needed to provide insights for decision-makers on how to effectively move forward in the next 10 years.

Challenges and limitations do exist on the method of the literature review as the SDG 14 targets are very broad and cover vast areas of knowledge and international negotiation. Secondly, despite their breadth, the SDG 14 targets are of intergovernmental, transboundary and areas beyond national jurisdiction, which means they may not always reflect local or national sustainable development priorities and problems, and there may be visible gaps from local and national perspectives. Another challenge is to have access to relevant literature review text for different targets and ensuring there is enough scientific substance for the analysis to be of interest for researchers in the field.

The challenging question is - to what degree have we achieved the 2020 targets for our oceans?

1.1 Marine Pollution Impacts - Current Scenario and Combat Strategies

Whether deliberately discharged or unintentionally introduced, plastic waste, oil, pharmaceuticals, toxic heavy metals, insecticides and other chemicals have found their way to every corner of the oceans. The consequences are catastrophic and often lethal, especially for marine organisms.

The only good news is that international prohibitions of some pollutants are beginning to have an effect. Without radical changes in industry and commerce, however, the pollution crisis in the oceans cannot be overcome. According to a report by the United Nations, there are now an estimated 5.25 trillion pieces of plastic debris in the ocean, with about 8 million tons of plastic being added every year. In the staggering numbers of 5.25 million pieces, the mass of 269,000-ton float on the surface, while some 4 billion plastic microfibres per square kilometre litter the deep sea. (Ref: National Geographic, January 2015).

Plastic Pollution can harm marine life through ingestion or entanglement, and can also have broader impacts on ecosystems by altering water quality and blocking sunlight. Besides the plastic pollution, here are some of the latest data on the impacts of marine pollution which include oil spills, chemical pollution, noise pollution and pollution due to climate change.

Oil Spills can have devastating impacts on marine ecosystems, killing fish, birds, and other wildlife, and damaging habitats. The 2010 Deepwater Horizon oil spill in the Gulf of Mexico, for example, is estimated to have killed millions of animals and caused long-term damage to the ecosystem.

Chemical Pollutants such as pesticides, herbicides, and industrial chemicals can also have harmful impacts on marine ecosystems, including disrupting the reproductive and immune systems of marine life, and altering the composition of marine food webs.

Noise pollution Human activities such as shipping, drilling, and sonar use can produce underwater noise that can disrupt marine life, including whales and dolphins, which rely on sound for communication, navigation, and hunting.

Climate change is also having significant impacts on marine ecosystems, including sea level rise, ocean acidification, and warming waters. These changes can alter marine habitats and food webs and affect the distribution and abundance of marine life.

Overall, the impacts of marine pollution on ocean ecosystems are significant and wide-ranging, and urgent action is needed to reduce pollution and protect these vital ecosystems.

1.2 Combat Strategies on Marine Pollution

Combatting marine pollution requires a multi-faceted approach involving various strategies and actions at different levels – from individual behaviour changes to international policy agreements. Here are some combat strategies on marine pollution.

Regulatory Framework and Policy Making

- Strengthen and enforce existing international agreements and conventions like MARPOL (International Convention for the Prevention of Pollution from Ships).

- Develop and implement stricter regulations on waste disposal, sewage discharge, and ballast water management for ships.
- Enforce laws against illegal fishing practices, dumping, and plastic waste disposal.
- Establish marine protected areas and regulate human activities in sensitive marine ecosystems.

Waste Management

- Improve waste management infrastructure, especially in coastal areas, to prevent land-based pollutants from entering the oceans.
- Promote waste reduction, recycling, and responsible waste disposal practices among individuals, communities, and industries.
- Implement extended producer responsibility (EPR) programs to hold manufacturers accountable for their products' end-of-life waste.

Plastic Pollution Mitigation

- Ban or restrict single-use plastics and microplastics in products.
- Promote alternatives to plastic products, such as biodegradable materials.
- Develop efficient waste collection systems to prevent plastic waste from reaching the oceans.

Educational Campaigns

- Raise public awareness about the impacts of marine pollution through educational campaigns, documentaries, and media.
- Educate individuals about proper waste disposal, recycling, and sustainable consumer choices.
- Conduct Ocean Literacy Training Program in collaboration with UN Agencies, International Ocean Institute and other local / regional and international NGOs.

Technological Solutions

- Develop and implement innovative technologies for cleaning up marine debris, such as ocean cleanup systems and autonomous drones.

- Use advanced sensors and satellite imagery to monitor pollution sources, hotspots, and movement patterns.

International Collaboration

- Foster collaboration among countries to share best practices, data, and research on marine pollution.
- Facilitate joint efforts to address transboundary pollution and implement coordinated response strategies.

Scientific Research

- Conduct research to better understand the sources, distribution, and impacts of marine pollution.
- Study the effects of pollutants on marine ecosystems and wildlife to inform policy decisions.

Corporate Responsibility

- Encourage industries to adopt sustainable production practices and reduce their pollution footprint.
- Support corporate initiatives for responsible waste management, product design, and supply chain management.

Community Engagement

- Involve local communities in beach cleanups, coastal restoration, and pollution monitoring activities.
- Empower coastal communities to take ownership of their natural resources and engage in sustainable practices.

Government Support and Funding

- Allocate funding for research, infrastructure development, and pollution control measures.
- Provide incentives for businesses and individuals to adopt environmentally friendly practices.

Combatting marine pollution requires a collaborative effort involving governments, industries, communities, and individuals. The combination of regulatory measures, technological innovation, education, and collective action can help reduce and eventually eliminate the threat of marine pollution.

1.3 SDG 14 - Current Scenario

SDG-14 aims to protect and ensure the sustainable use of oceans. This includes reducing marine pollution and ocean acidification, end overfishing, combat illegal, unreported and unregulated (IUU) fishing and conserve marine and coastal ecosystems.

Here are some recent updates on the success of SDG 14 targets:

1. **Target 14.1:** By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution.
2. **Target 14.2:** By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration: According to the United Nations, only 7.5% of the world's oceans are currently protected in marine protected areas, which falls short of the target of 10% by 2020. However, there has been progress in restoring degraded ecosystems, such as coral reefs and mangroves, which are vital for marine biodiversity.
3. **Target 14.3:** Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels: The scientific understanding of ocean acidification has increased, and there is growing awareness of its impacts. However, more needs to be done to address this issue, such as reducing carbon emissions and increasing research and monitoring efforts.
4. **Target 14.4:** By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics: While progress has been made in some regions, global overfishing remains a major concern, with 34.2% of fish stocks being overfished in 2017, according to the Food and Agriculture Organization of the United Nations.

5. **Target 14.5:** By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information: As mentioned earlier, only 7.5% of the world's oceans are currently protected in marine protected areas, which falls short of the target of 10% by 2020.
6. **Target 14.6:** By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation.

The World Trade Organization (WTO) has been negotiating on fisheries subsidies for several years, with the aim of reaching an agreement to prohibit harmful subsidies. In December 2020, the WTO members agreed to a new set of rules that would prohibit subsidies that contribute to overfishing and overcapacity, but with exemptions for certain types of subsidies for developing countries.

7. **Target 14.7:** By 2030, increase the economic benefits to Small Island Developing States (SIDS) least developed countries from sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism.

1.4 Additional Targets of SDG 14

14.a: Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular Small Island Developing States (SIDS) and least developed countries

14.b: Provide access for small-scale artisanal fishers to marine resources and markets

14.c: Ensure the full implementation of international law, as reflected in the United Nations Convention on the Law of the Sea for States parties thereto, including, where applicable, existing regional and international regimes for the conservation and sustainable use of oceans and their resources by their parties.

Below Table shows how the SDG 14 targets can be simply grouped according to the three key themes.

Table 1 - Grouping of SDG 14 targets with three key themes

Marine Pollution	Ocean and Climate	Sustainable use of Marine and Ocean Resources
14.1	14.2	14.4
	14.3	14.6
	14.5	14.7

Overall, progress towards achieving SDG 14 has been mixed, with some targets being met or exceeded, while others are falling behind. More concerted efforts are needed to address the challenges facing the world's oceans and marine resources, such as overfishing, pollution, and climate change.

1.5 Global Collaborations on SDG 14

Sustainable Development Goal 14 (SDG 14) focuses on conserving and sustainably using the oceans, seas, and marine resources for sustainable development. It aims to address various challenges related to marine ecosystems, overfishing, pollution, and climate change impacts on the oceans. Global collaborations on SDG 14 are essential to achieve its targets and ensure the long-term health and sustainability of our oceans. Here are some examples of global collaborations and initiatives related to SDG 14:

United Nations Convention on the Law of the Sea (UNCLOS): UNCLOS is a global legal framework that establishes the rights and responsibilities of nations regarding the use of the world's oceans and their resources. It provides a basis for international cooperation in managing marine resources and protecting the marine environment.

The Ocean Conference: The United Nations has organized Ocean Conferences to raise awareness and accelerate actions for the implementation of SDG 14. These conferences bring together governments, NGOs, scientists, and other stakeholders to discuss and share best practices for ocean conservation and sustainable use.

World Ocean Day: Celebrated on June 8th each year, World Ocean Day provides an opportunity for people around the world to come together to raise awareness about the importance of the oceans and to promote sustainable practices.

Partnerships and Collaborative Initiatives: Numerous international partnerships and initiatives focus on ocean conservation and sustainable use. These include collaborations between governments, non-governmental organizations, academia, and the private sector. Examples include the Global Partnership for Oceans, the Global Ocean Observing System (GOOS), and the Coral Triangle Initiative.

Marine Protected Areas (MPAs): Countries around the world are establishing marine protected areas to conserve biodiversity and provide a safe haven for marine life. These efforts often involve international collaboration to establish transboundary or interconnected MPAs.

International Research and Monitoring Programs: Scientific research is crucial for understanding the state of the oceans and identifying effective conservation strategies. Initiatives like the Intergovernmental Oceanographic Commission (IOC) of UNESCO support international ocean research and monitoring efforts.

Sustainable Fisheries Management: International organizations such as the Food and Agriculture Organization (FAO) work to promote sustainable fishing practices and support the management of fisheries to prevent overfishing and ensure long-term fish stocks.

Reducing Marine Pollution: Global efforts to reduce marine pollution involve collaboration on waste management, plastic reduction, and other measures to minimize the impact of pollutants on the oceans.

Climate Change Mitigation and Adaptation: Since climate change significantly affects the oceans, global collaborations on climate change mitigation and adaptation strategies play a crucial role in achieving SDG 14.

Capacity Building and Knowledge Sharing: Many initiatives focus on building the capacity of developing countries to manage their marine resources sustainably. Knowledge sharing and technology transfer are essential components of these efforts.

These are just a few examples of the many global collaborations and initiatives aimed at achieving SDG-14. The interconnected nature of ocean health and our own survival requires ongoing cooperation and joint efforts at the international level to ensure the well-being of our oceans and their resources for current and future generations.

1.6 Role of IMO in achieving SDG 14 Targets

The International Maritime Organization (IMO) plays a crucial role in achieving the targets set out in Sustainable Development Goal 14 (SDG 14), which focuses on conserving and sustainably using the oceans, seas, and marine resources for sustainable development. SDG 14 consists of several targets aimed at addressing various aspects of marine sustainability, including marine pollution, overfishing, ocean acidification, and the protection of marine ecosystems. The IMO's role in achieving these targets primarily revolves around its regulatory and coordination functions within the maritime industry. Here's how the IMO contributes to the achievement of SDG 14 targets:

Marine Pollution (Target 14.1): The IMO is responsible for developing and implementing regulations to prevent and reduce marine pollution from ships. It has established various conventions, including the MARPOL Convention, which sets standards for the discharge of pollutants from ships into the oceans. The IMO also addresses the issue of plastic pollution in the oceans and works towards reducing the use of single-use plastics in the maritime sector.

Sustainable Management of Fisheries (Target 14.4): The IMO contributes to the sustainable management of fisheries by developing guidelines and regulations that help prevent illegal, unreported, and unregulated (IUU) fishing activities. These activities contribute to overfishing and threaten marine biodiversity. Through its capacity-building programs and technical assistance, the IMO assists countries in enhancing their ability to combat IUU fishing.

Ocean Acidification (Target 14.3): While the direct role of the IMO in addressing ocean acidification is limited, its efforts to reduce greenhouse gas emissions from ships indirectly contribute to mitigating this phenomenon. The IMO's Energy Efficiency Existing Ship Index

(EEXI) and Carbon Intensity Indicator (CII) regulations aim to reduce the carbon footprint of the maritime sector, which can help mitigate the impacts of ocean acidification.

Conservation of Marine and Coastal Ecosystems (Target 14.5): The IMO supports the conservation of marine and coastal ecosystems through measures such as designating Particularly Sensitive Sea Areas (PSSAs) and Special Areas, where additional protective measures are applied to prevent environmental damage from shipping activities.

Support for Developing Countries (Target 14.A): The IMO provides technical assistance and capacity-building support to developing countries to help them effectively implement international regulations related to maritime safety and environmental protection. This support enhances these countries' ability to contribute to SDG 14 targets.

Research and Data Collection (Target 14.7): The IMO facilitates the exchange of information and data related to maritime safety, security, and environmental protection. This information exchange supports evidence-based decision-making and contributes to the understanding of the state of the oceans and marine resources.

Global Partnership for Sustainable Oceans (Target 14.b): The IMO collaborates with other international organizations, governments, and stakeholders to achieve the goals of SDG 14. Through partnerships, joint initiatives, and cooperation, the IMO contributes to the global effort to ensure the sustainability of the oceans.

In summary, the IMO's role in achieving SDG 14 targets involves establishing and implementing regulations, providing technical assistance, promoting cooperation, and facilitating sustainable practices within the maritime industry to ensure the conservation and sustainable use of oceans and marine resources.

1.7 Role of IUCN in Achieving SDG14 Targets

The International Union for Conservation of Nature (IUCN) plays a significant role in achieving the targets set out in Sustainable Development Goal 14 (SDG 14), which focuses on conserving and sustainably using the oceans, seas, and marine resources for sustainable development. The IUCN is a global organization that works on a wide range of conservation issues, including marine and coastal conservation. Here's how the IUCN contributes to the achievement of SDG 14 targets:

Advocacy and Policy Development: The IUCN plays a key role in advocating for strong policies and regulations that promote the conservation and sustainable use of marine ecosystems. It provides scientific expertise and policy recommendations to governments and international bodies, influencing the development of policies related to marine protected areas, fisheries management, and ocean governance.

Marine Protected Areas (MPAs) and Biodiversity Conservation (Targets 14.2 and 14.5): The IUCN works to establish and manage marine protected areas around the world. It provides guidance on MPA design, management, and monitoring, helping countries create effective networks of protected areas that contribute to conserving marine biodiversity and ecosystems.

Sustainable Fisheries Management (Targets 14.4 and 14.6): The IUCN promotes sustainable fisheries management practices by providing scientific assessments, guidelines, and recommendations for responsible fishing. It advocates for the adoption of ecosystem-based fisheries management approaches that take into account the broader marine ecosystem and its health.

Climate Change and Ocean Resilience (Targets 14.3 and 14.7): The IUCN conducts research and assessments on the impacts of climate change on oceans and marine ecosystems. It contributes to the understanding of ocean acidification, sea level rise, and other climate-related challenges. The organization also promotes the conservation and restoration of coastal habitats to enhance the resilience of marine ecosystems to climate change.

Capacity Building and Knowledge Sharing: The IUCN provides training, capacity-building programs, and knowledge sharing to governments, communities, and stakeholders. It helps build the capacity of local communities and institutions to manage marine resources sustainably and implement effective conservation strategies.

Public Awareness and Education: The IUCN raises public awareness about the importance of marine conservation through campaigns, education initiatives, and communication efforts. It helps foster a sense of responsibility and stewardship for the oceans among individuals and communities.

Partnerships and Collaboration (Target 14.B): The IUCN collaborates with governments, non-governmental organizations, academic institutions, and the private sector to promote joint efforts

in achieving SDG 14 targets. It works to build partnerships that leverage diverse expertise and resources to address complex marine conservation challenges.

Assessment and Monitoring: The IUCN conducts assessments of marine species, habitats, and ecosystems to provide up-to-date information on their conservation status. These assessments inform decision-making and support the identification of priority areas for conservation.

In summary, the IUCN plays a vital role in achieving SDG 14 targets by advocating for policy change, promoting conservation strategies, providing expertise and guidance, building capacity, raising awareness, and fostering collaboration. Through its multi-faceted approach, the IUCN contributes to the global effort to ensure the sustainability of oceans, seas, and marine resources.

1.8 Role of UNFCCC in Achieving SDG 14 Targets

The United Nations Framework Convention on Climate Change (UNFCCC) plays a significant role in addressing climate change, including its impacts on the oceans, and contributes to the achievement of various Sustainable Development Goals (SDGs), including SDG 14 which focuses on the conservation and sustainable use of oceans, seas, and marine resources. While the primary focus of the UNFCCC is on addressing climate change, its actions have implications for ocean health and marine ecosystems.

Here's how the UNFCCC contributes to the goals of SDG 14:

Climate Change Mitigation (Targets 14.3 and 14.7): The UNFCCC's main objective is to stabilize greenhouse gas concentrations in the atmosphere to prevent dangerous human-induced interference with the climate system. The reduction of greenhouse gas emissions, including carbon dioxide, is essential for minimizing the impacts of climate change on the oceans. This is important for combating ocean acidification and ensuring the overall health and resilience of marine ecosystems.

Global Temperature Goals: The UNFCCC's Paris Agreement aims to limit global warming well below 2 degrees Celsius above pre-industrial levels and pursue efforts to limit it to 1.5 degrees Celsius. Achieving these temperature goals is crucial for preventing the most severe impacts of climate change, including sea-level rise and changes in ocean circulation patterns that could affect marine ecosystems and coastal communities.

Adaptation and Resilience (Targets 14.2, 14.5, and 14.A): The UNFCCC recognizes the need for adaptation to the impacts of climate change. Many of these impacts, such as sea-level rise, increased storm intensity, and ocean warming, directly affect coastal and marine ecosystems. Through the Adaptation Committee and various funds established under the Convention, the UNFCCC supports developing countries in building resilience and adapting to these changes.

Financial Support (Targets 14.a and 14.b): The UNFCCC facilitates financial support from developed countries to developing countries to help them address climate change impacts. This includes support for sustainable ocean management and conservation efforts, capacity-building, technology transfer, and addressing the unique challenges faced by Small Island Developing States (SIDS) and Least Developed Countries (LDCs).

Scientific Research and Monitoring: The UNFCCC's Subsidiary Body for Scientific and Technological Advice (SBSTA) regularly reviews and assesses scientific information related to climate change impacts and adaptation. This includes research on the effects of climate change on oceans, marine biodiversity, and ecosystems.

Synergies with Other Conventions (Targets 14.1 and 14.4): The UNFCCC works in coordination with other international agreements and organizations to address cross-cutting issues such as marine pollution and sustainable fisheries management. For example, actions taken under the UNFCCC can have positive effects on reducing pollution from maritime activities.

In summary, while the UNFCCC's primary mandate is to address climate change, its efforts have profound implications for the health and sustainability of oceans and marine ecosystems. By addressing the root causes of climate change and supporting adaptation and resilience measures, the UNFCCC indirectly contributes to the achievement of SDG14 targets and the overall well-being of marine environments.

2. FINDINGS ON THE BIGGER PICTURE OF SDG 14 – NATIONAL IMPLEMENTATION TO GLOBAL MONITORING

“Global Manual on Ocean Statistics” aims to provide guidance on how to bring together traditional monitoring techniques with new technologies and data science in order to better monitoring our

oceans in the context of the SDGs. The report focuses on the SDG indicators where UNEP is the custodian and responsible for global monitoring, including SDG 14.1.1(a) on coastal eutrophication; SDG 14.1.1(b) on marine debris, SDG 14.2.1 on marine area management and SDG 14.5.1 on protected areas and conservation.

"The Global Manual on Ocean Statistics" provides guidance for national governments and national institutions to support the country-level implementation of SDG Indicators 14.1.1a, 14.1.1b, 14.2.1 and 14.5.1 in their national waters. Note that there are a number of challenges and limitations facing monitoring in the high seas. Particularly problematic are transboundary marine issues such as ocean acidification or marine plastics. For such issues, the monitoring of national waters, which is the primary focus of the SDG indicators, only shows part of the picture. This manual focuses on national monitoring, but there is a need for additional research and support to measure the areas beyond national jurisdiction for analytical use, including for analysis of the SDGs.

Implementing SDG indicators at Country Level

The "Global Manual on Ocean Statistics" is intended to support countries in their efforts to implement indicators for tracking progress against SDG 14. The country missions to Fiji and Colombia highlighted that countries start off from different contexts, and face different challenges, in implementing the SDG indicators. Some countries, like Colombia, already have centralised data gathering systems and/or national indicators in place that can be built on to implement the SDG indicators. In contrast, Fiji and other Pacific Island nations are only just starting to address the SDG targets and indicators at country level; here, the SDG process is mainly being driven forward at the regional level by the Pacific Regional Seas Programme and other regional institutions. One common challenge that countries in both regions share is limited funds and capacity for monitoring programs.

Coordinated international monitoring of transboundary issues.

As mentioned in the introduction to the "Global Manual on Ocean Statistics", many issues remain to be resolved in order to achieve more complete global monitoring of transboundary marine issues, including in areas beyond national jurisdiction. This will require countries to work together in a coordinated effort using both satellite remote sensing and in situ international surveys, including shared data collection protocols, good data sharing practices, innovative and cost-

effective sampling methodologies. The Regional Seas Programs are working towards coherent and coordinated monitoring approaches within, as well as across, regional seas, and could play an important role in facilitating coordinated international monitoring efforts.

Globally applicable methodologies to track global progress.

Finally, the "Global Manual on Ocean Statistics" recognises that the agreed SDG and their indicators only capture part of the associated SDG targets. In the long-term, these limitations will have to be addressed to ensure that SDG 14 is fully met. In the meantime, however, it is important to focus on what can be realistically achieved by all countries, so that data can be meaningfully aggregated to give a global picture of progress towards SDG 14. The "Global Manual on Ocean Statistics" aims to support this effort by providing step-by-step indicator methodologies that require minimum resources and technical capacity, can be integrated with existing national and regional approaches, and provide the minimum parameters required to monitor progress against SDG Targets 14.1, 14.2 and 14.5.

Assessment of Achievements – Methodology

Currently, various databases of UN agencies can be accessed to have updated information on assessment and achievement levels of SDG 14 targets.

Table 2 - Databases used to assess the achievement of SDG-14

Target	UN Indicator	Databases	Proportion of countries covered
14.2	Proportion of national exclusive economic zones managed using ecosystem-based approaches	- Franzao et al., 2020 - IOC-UNESCO status of Marine Spatial Planning - MSP Global Compendium of MSP initiatives - Barrag´an Mu˜noz (2020) (with all four sources combined)	81%

		Ocean Health Index (OHI)	100%
14.4	Proportion of fish stocks within biologically sustainable levels	Sea Around Us stock status plots Marine Trophic Index (MTI)	78% 97%
14.5	Coverage of protected areas in relation to marine areas	World Database on Protected Areas Key Biodiversity areas (KBA)	100% 93%
14.6 (This target refers to fisheries subsidies, but its indicator refers to IUU fishing).	Progress by countries in the degree of implementation of international instruments aiming to combat illegal, unreported and unregulated fishing	IUU Fishing Index	100%
14.7 (This target refers to SIDS and least developed countries	Increase the economic benefits to Small Island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism.		

(Courtesy: Ocean and Coastal Management 227 (2022) 106273; M. Andriamahefazafy et al.)

2.1 SDG 14 Reporting Methodologies and Proposed Indicators (Ref: UNEP 2021)

A review of existing indicators and methodologies used by Regional Seas Programs and other key intergovernmental, international or regional bodies shows that marine plastic debris is currently monitored in four areas of the marine environment. The agreed indicator for marine plastic litter under SDG Target 14.1, as proposed by the IAEG-SDGs, is on marine plastic debris (14.1.1b). Based on the existing internationally agreed Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) guidelines and the existing national data collections, it is recommended that the SDG reporting includes sub-indicators related to beach litter, floating plastic and plastic in the sea column, plastic on the sea floor and additional option indicators. Indicators on micro-litter may also be considered as optional. The proposed global indicators are based on feasibility and relevance. All indicators described below are consistent with the GESAMP guidelines on monitoring marine plastics which were published in 2019. The GESAMP 2019 (Guidelines for Monitoring and Assessment of Plastic Litter in the Ocean) is an internationally agreed standard which was launched in March 2019.

Reporting Level 1: Proposed global indicators:

1. Plastic patches greater than 10 meters (for Areas Beyond National Jurisdiction or Total Oceans).
2. Beach litter originating from national land-based sources.

Reporting Level 2: Proposed national indicators:

1. Beach litter count per km2 of coastline (surveys and citizen science data).
2. Floating plastic debris density (visual observation, manta trawls).
3. Water column plastic density (demersal trawls).
4. Seafloor litter density (benthic trawls (e.g., fish survey trawls), divers, video/camera tows, submersibles, remotely operated vehicles).

Reporting Level 3: Supplementary indicators:

1. These are listed in a separate table for information but are not described in detail in this man.

Table 3 - Monitoring parameters for marine plastic litter to track progress against SDG Indicator 14.1.1b. (UNEP 2021)

Monitoring Parameters (and methods)	**Level 1**	**Level 2**	**Level 3**
Plastic patches greater than 10 meters*	X		
Beach litter originating from national land-based sources	X	X	
Beach litter (beach surveys)		X	
Floating plastics (visual observation, manta trawls)		X	
Water column plastics (demersal trawls) Seafloor litter (benthic trawls (e.g., fish survey trawls), divers, video/camera tows, submersibles, remotely operated vehicles)		X	
Beach litter microplastics (beach samples)			X
Floating microplastics (manta trawls, e.g., Continuous Plankton Recorder)			X
Water column microplastics (demersal plankton trawls)			X
Seafloor litter microplastics (sediment samples)			X
Plastic ingestion by biota (e.g., birds, turtles, fish)			X
Plastic litter in nests			X
Entanglement (e.g., marine mammals, birds)			X
Plastic pollution potential (based on the use and landfilling of plastics)			X
River litter			X
Other parameters related to plastic consumption and recycling			X
Health indicators (human health and ecosystem health)			X

** This indicator is most useful for areas beyond national jurisdiction or total ocean area, not for national monitoring. These indicators are marked as levels 1, 2 or 3, level 1 being global data or globally modelled, level 2 including national monitoring and level 3 describing supplementary / recommended indicators.*

2.2 Ocean Source of Our Life and Livelihoods – A Sustainable Relationship

The benefits provided by oceans, seas and marine resources are important to all people, the poor, indigenous peoples, and vulnerable groups with a high dependency on natural resources and ecosystem services may have their well-being especially tied to these benefits. The link between oceans, seas and marine resources and human well-being is not one-sided. While an increase in human well-being is frequently generated at the cost of ecosystem integrity, it can also potentially reduce the negative anthropogenic impacts on the marine environment due to a more sustainable use of resources, changes in production and consumption patterns and improved management and control of human activities, for example. In order for this to happen, good governance and an enabling environment are, however, required.

The seas are warmer than at any point in human history and life under water is facing myriad threats, but there are still reasons to hope to maintain sustainable relationship between humans and ocean in order to timely achievement of the Sustainable Development Goals (SDGs) focused on the world's oceans can be met.

Reducing pollution from shipping as well as emitting CO2 ships are a major sources of air pollution. From 2020, to comply with the International Convention for the Prevention of Pollution from Ships, ships operating worldwide, have had to use fuels that contain less than 0.5 per cent sulphur. In 2021, the IMO's Marine Environment Protection Committee adopted updated guidelines for exhaust cleaning systems, as well as a resolution urging the voluntary use of cleaner alternative fuels and alternative methods of propulsion for ships operating in or

near the Arctic. Another major form of maritime pollution is bunker oil spills. Risks are growing and the need to ensure the availability of adequate compensation deserves renewed attention. While work continues at the IMO on developing a claims manual for the Bunker Oil Pollution Convention, 2001, it will be important to ensure that the manual effectively responds to the needs and concerns of claimants, including in vulnerable developing countries.

In November 2021, reacting to the ever-growing crisis of plastic pollution the IMO adopted a strategy on marine plastic litter from ships. And in March 2022, UNEP adopted a resolution for an international legally binding instrument to end plastic pollution.

2.3 SDG 14 – To what degree have we achieved the 2020 targets for our oceans

As a whole, achievement of SDG 14 has been meagre, with no single country having achieved the four targets aimed for by the SDG 14 indicators (Fig - 1 and Fig – 2). Only two countries worldwide (Belgium and Germany) have achieved three of the targets (Table - 3). Less than 30% (45 countries) have achieved at least one of the targets, resulting in the significant finding that more than two thirds of coastal states globally (107 out of the 152) have not achieved a single of the four SDG targets under assessment. (more details on achievement of each country per indicator available on databases referred in UNEP database).

Figure 1 - Global status of achievement across four SDG 14 targets

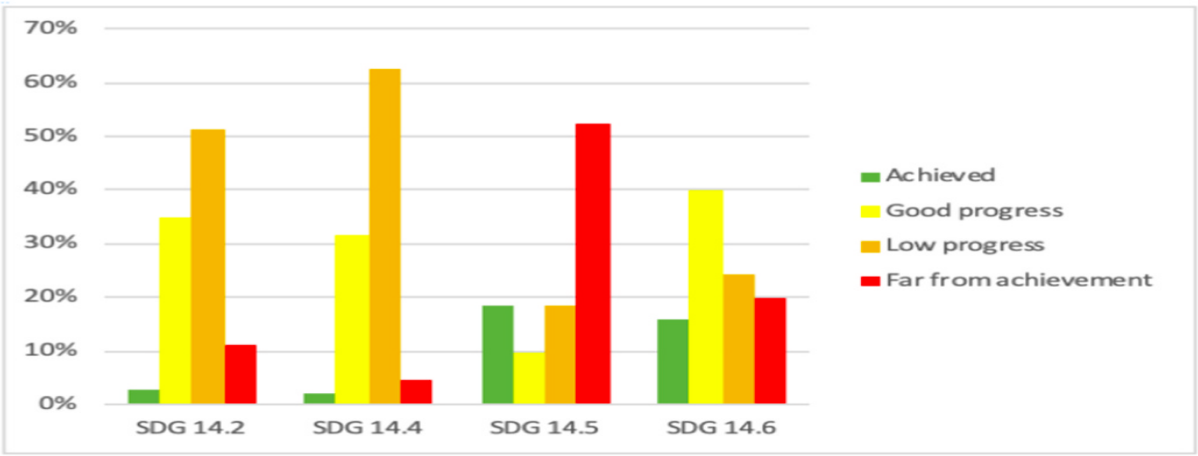


Table – 3 :

Table 4 - Countries at the highest classification, having made the most progress for one of the 4 targets. [Ref: M. Andriamahefazafy et. al]

Country	Region	SDG 14.2	SDG 14.5	SDG 14.4	SDG 14.6
Belgium	Europe	✓	✓		✓
Germany	Europe	✓	✓		✓
Ecuador	South America		✓		✓
Estonia	Europe		✓		✓
France	Europe		✓		✓
Netherlands	Europe	✓	✓		
Poland	Europe		✓		✓
Romania	Europe		✓		✓
Sweden	Europe		✓		✓
USA	North America		✓		✓

Figure 2 - Global maps of achievement of the four SDG 14 targets (14.2, 14.4, 14.5 and 14.6). [Ref: M. Andriamahefazafy et. Al]

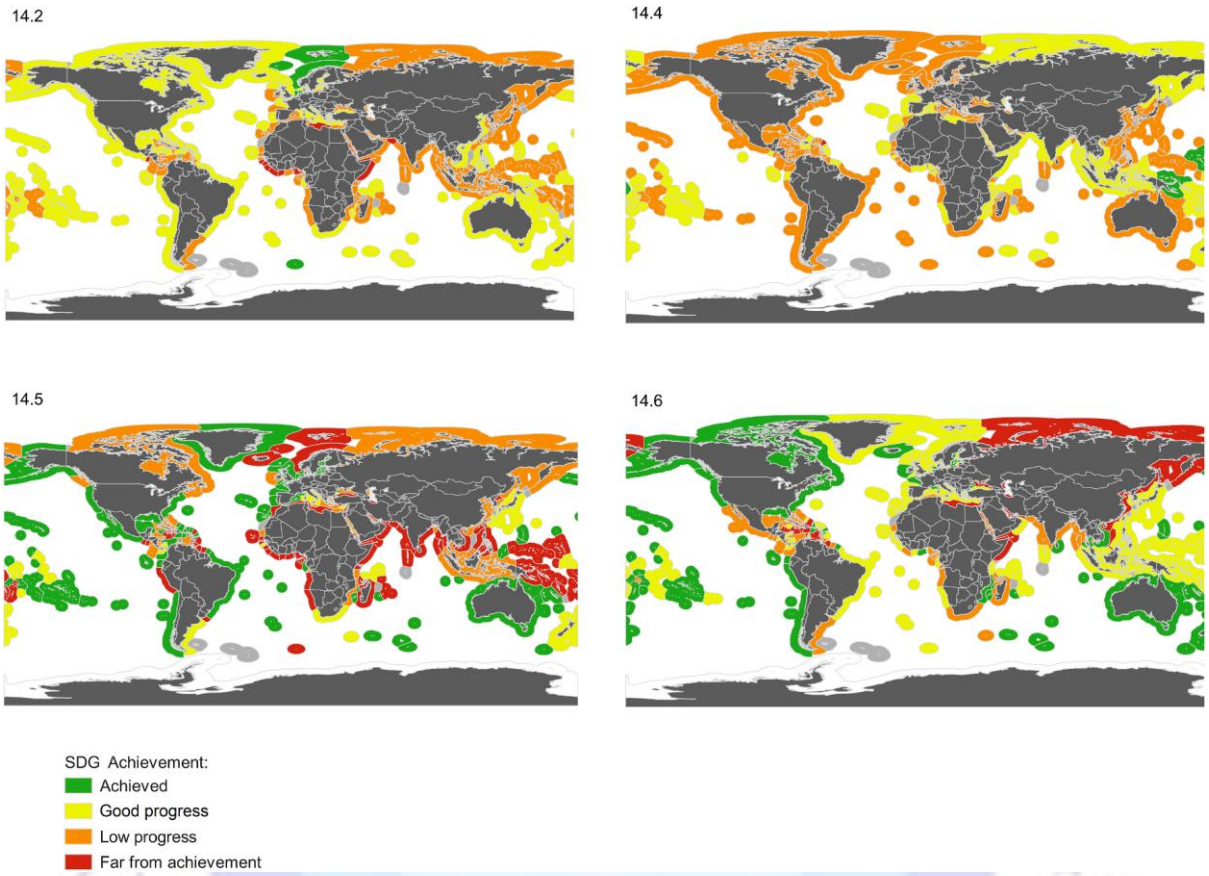


Table 5 - Countries at the highest classification, far from achievement for at least 2 targets.

Country	Region	SDG 14.2	SDG 14.4	SDG 14.5	SDG 14.6
Bahrein	Middle East		x	x	x
Eritrea	Africa	X		x	x
Libya	Africa	X		x	X
Somalia	Africa	X		x	X
Syria	Middle East	X		x	x
Antigua and Barbuda	Caribbean & Central America		x	x	

Brunei Darussalam	Southeast Asia			x	x
Benin	Africa	X		x	
Bosnia and Herzegovina	Europe	X		x	
C^ote d'Ivoire	Africa	X		x	
El Salvador	Caribbean & Central America	X		x	
Georgia	Middle East	X		x	
Guinea	Africa	X		x	
Guyana	South America			x	x
Haiti	Caribbean & Central America				x
Iraq	Middle East	X		x	
Lebanon	Middle East	X		x	
Liberia	Africa	X		x	
Pakistan	Asia	X		x	
Nigeria	Africa	X		x	
Sierra Leone	Africa	X		x	
Togo	Africa	X		x	

[Ref: SDG 14 – Ocean and Coastal Management, M. Andriamahefazafy et. al.]

2.4 Sustainable Development Goals progress at the midpoint

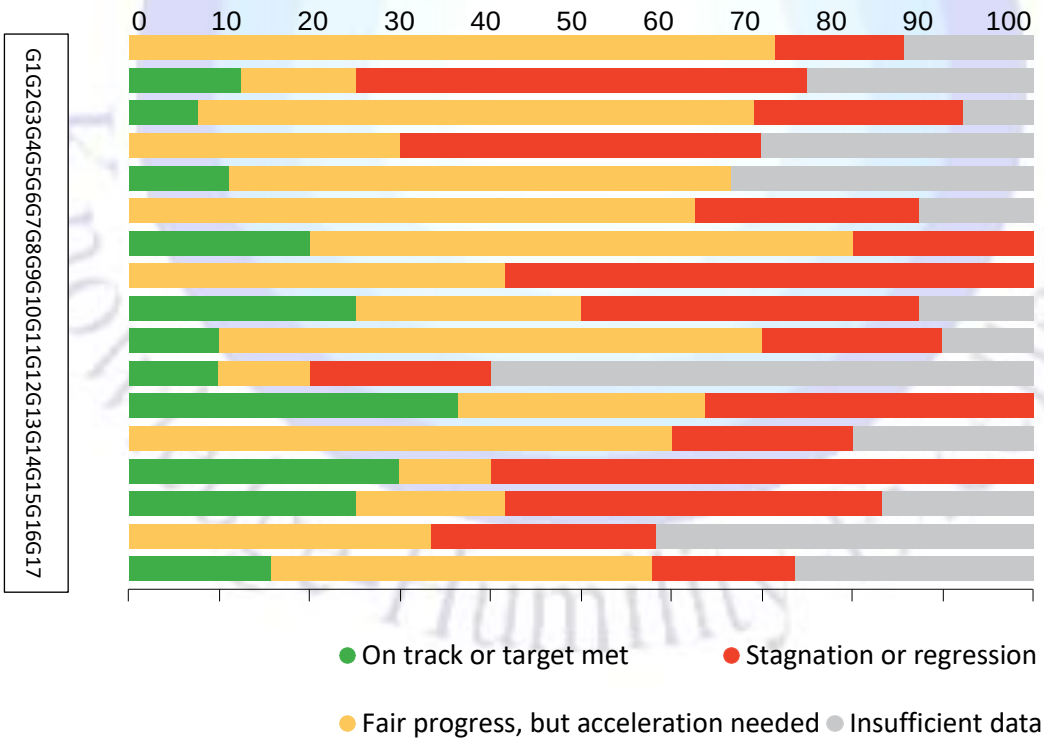
A reality check of the progress made on the SDGs at the midpoint towards 2030 reveals significant challenges. The latest global-level data and assessments from custodian agencies1 paint a concerning picture of the approximately 140 targets that can be evaluated, half of them show moderate or severe deviations from the desired trajectory. Furthermore, more than 30 per cent of these targets have experienced no progress or, even worse, regression below the 2015 baseline.

This assessment underscores the urgent need for intensified efforts to ensure the SDGs stay on course and progress towards a sustainable future for all.

Delays towards SDG 14 targets

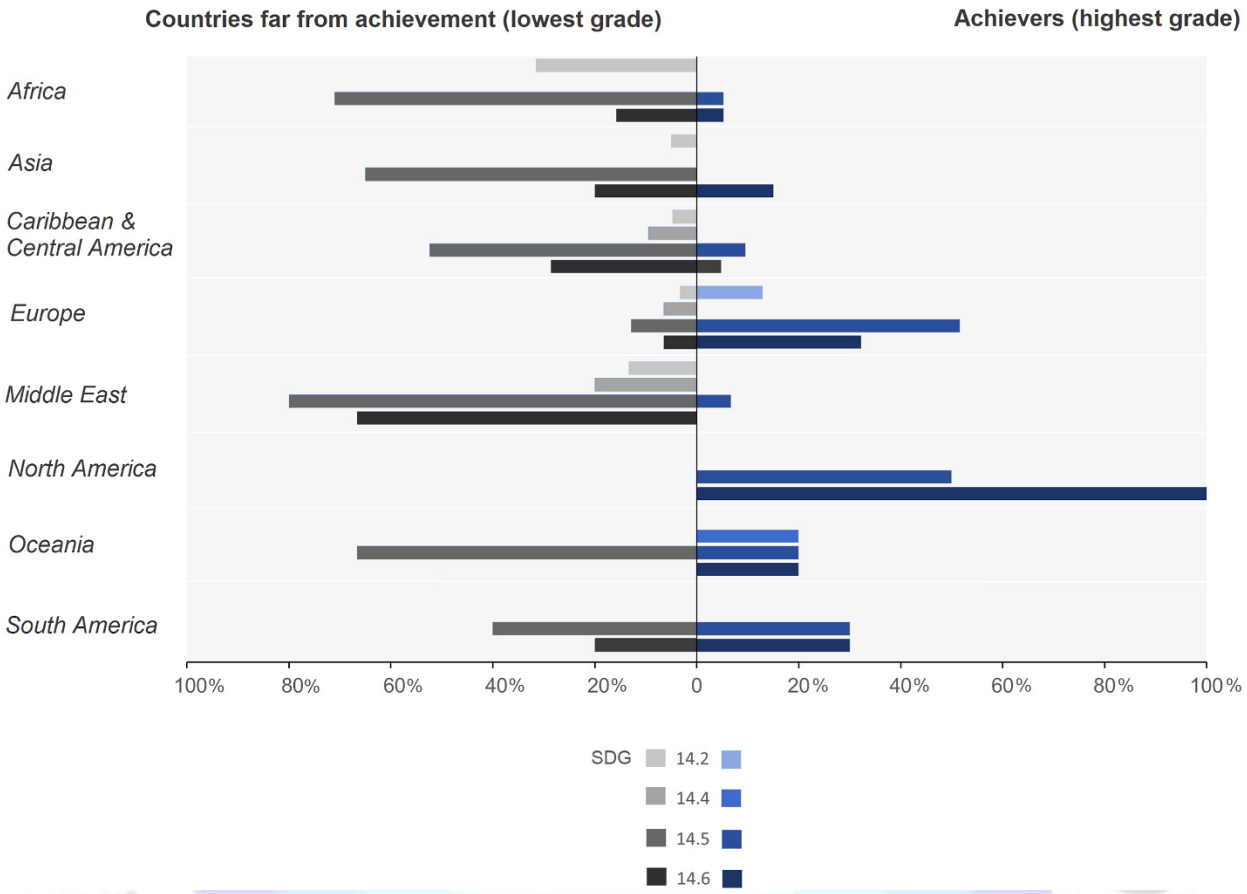
Based on the foregoing analysis, it arises that the achievement of the four assessed 2020 targets of SDG 14 has been underwhelming. This result embodies both a reality-check and a wake-up call showing that not enough has been done, and that the global achievement of the 2020 SDG 14 targets is a round and inclusive failure. The lack of achievement was not surprising considering the ambition of the 4 targets and especially that two indicators (14.2 and 14.4) were entirely new compared to the other two (14.5 and 14.6) that were monitored relatively well through other existing targets or indexes.

Figure 3 - Progress assessment for the 17 Goals based on assessed targets



Protected area coverage alone does not give a full indication of the importance of an area in terms of biodiversity (and derived ecosystem services), for example the diversity of species that have been protected or the number of people who are benefiting from the protected area (Gill et al. 2017).

Figure 4 - Percentage (%) of achieving and non-achieving countries in each region by targets.



[Ref: SDG 14 – Ocean and Coastal Management, M. Andriamahefazafy et. al.]

As such, a calculation of the relative coverage, by protected areas, of those marine areas which are of particular importance for biodiversity (and derived ecosystem services) is a useful approach to assess the comprehensiveness and value of an MPA network. Surprise came that SDG 14.5 (MPA coverage) which found many countries still far off from achieving the goal. The goal is not new and builds on the CBD Aichi target 11 set in 2011 which also aimed at achieving 10% of MPA coverage by 2020. Even so, the achievement of SDG 14.5 could also be questioned as achievement can also be linked to the gazetting of large marine areas that harbour few coastal communities (the case of countries like France, the UK or New Zealand gazetting overseas and outermost uninhabited territories) and can greatly increase the global achievement of MPA coverage. These areas currently make up 17.8% of all EEZs, and 7.68% of all marine areas. Furthermore, implementing such a quantitative target is not without controversy. These objectives can distract attention, among other things, from the real "outcomes" expected of these MPAs, for instance, to guarantee general functionality of natural environments (Visconti et al., 2019), while low-income countries lack capacity to create and maintain large offshore MPAs.

SDG 14.6 on combatting IUU fishing is the target that has seen the most progress of the four assessed, more than half of countries having achieved or made good progress. By developing national plans of action to combat IUU fishing, and signing up to response-related instruments, such as the FAO Compliance Agreement or the Agreement on Port State Measures, nations are gradually improving their ability to establish better systems to combat IUU fishing.

2.5 SDG 14 – Consistent Challenges

Oceans, seas and marine resources are increasingly threatened, degraded or destroyed by human activities, reducing their ability to provide crucial ecosystem services. Important classes of threats are, among others, climate change, marine pollution, unsustainable extraction of marine resources and physical alterations and destruction of marine and coastal habitats and landscapes. The deterioration of coastal and marine ecosystems and habitats is negatively affecting human well-being worldwide. Key challenges for achieving sustainable development goal "Life Below Water" are envisioned as stated below:

- War and Instability – Regional / Global Conflicts due to geo-political and geo-economic issues
- Suitability and Availability
- Governmental Issues in specific countries
- Poverty and Unemployment
- The Global Economy
- Population Growth and Demographic Conflicts Created
- Resurfacing of Pandemic Diseases

In the course of the last century, the oceans have been transformed by human activity. Intensive fishing has decimated marine life, stripping the seas of scores of species. Plastic has infiltrated the remotest points on the planet, from the bottom of the Marina Trench to the Siberian Arctic. In order for oceans, seas and marine resources to successfully contribute to human well-being, ecosystem integrity, with properly functioning biogeochemical and physical processes, is required. This does not require unperturbed systems, but systems that have not suffered serious or irreversible harm. Ecosystem integrity allows for the provision of so-called supporting ecosystem

services which, in turn, are the bases of important regulating, provisioning and cultural ecosystem services that are of crucial importance for humans.

Humanity's 200-year habit of pumping carbon dioxide into the atmosphere is raising the temperature of seawater while lowering its PH level causing acidification of it, hence, unleashing a series of potentially catastrophic cascading impacts, from the melting of the polar ice caps and the rise of global sea levels to the collapse of the planet's coral reefs and the acidification of its oceans.

Responding to this environmental crisis, in 2015 the UN devoted one of its 17 Sustainable Development Goals (SDGs) exclusively to the state of the oceans and SDG 14 described as "Life Under Water" establishes a wide-ranging goal to "conserve and sustainably use the world's oceans, seas and marine resources". Breaking down this broad ambition are 10 targets, addressing key threats to ocean ecosystems, such as pollution, overfishing, eutrophication and acidification, while also setting specific goals for extending protected areas and supporting sustainable fisheries in the developing world. Rising ocean temperatures are causing bleaching events in the world's corals and cause stress leading to the expulsion or reduction of the photo synthetic algae. Since these algae are responsible for producing a significant portion of the coral’s food and contribute to the vibrant colours of the corals, their loss results in a pale or bleached appearance. The reduction in algae compromises the coral’s energy production, making them more susceptible to diseases and other environmental stressors.

2.6 Epilogue

The United Nations has estimated that humankind discharges around 400 million tonnes of pollutants into the sea annually. Evidence of this persistent pollution can now be found in all regions of the world‘s oceans – on remote islands, in the polar regions and in the deepest

ocean trenches. Substances that are concentrated in the food chain are especially harmful because these pose a real danger to marine organisms as well as to people. Building the climate resilience of maritime transport systems is therefore a precondition for sustainability. Climatic factors such as rising water levels, floods, storms, precipitation, extreme weather events, and associated risks such as coastal erosion, inundation, and deterioration of hinterland connections have implications for shipping volumes and costs, cargo loading and capacity, sailing and/or loading schedules,

storage, and warehousing. Here, we foresee the obstructive role that marine pollution plays in and challenges imposed in achieving all the targets of SDG-14 and likewise the national and international interests that drive the processes of negotiating international agreements, as well as their challenges to date. significance in emerging global initiatives such as the UN Decade of Ocean Science for Sustainable Development (2021–2030).

Human well-being cannot be achieved without the protection and conservation of the Earth's ecosystem. To maintain the quality of life that the oceans have provided to humankind, while sustaining the integrity of their ecosystems, a change will be required in how humans view, manage and use oceans, seas and marine resources. Following the principles of multi-stakeholder partnerships for the enhancement of the Global Partnership for Sustainable Development, complementing the multi-stakeholders' partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the Sustainable Development Goals in all countries, in particular developing countries is the utmost desirable scenario in coming days. While my literature review is consistent and keeping pace with new findings on SDG 14 targets achievements, it needs to remain continuous and updated.

APPENDIX

SDG 14 - Targets

Conserve and Sustainable Exploitation of the Ocean, Seas and Marine Resources for the Sustainable Development

14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution.

14.2 By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans.

14.3 Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels.

14.4 By 2020, effectively regulate harvesting and end overfishing, illegal, unreported, and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics.

14.5 By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information.

14.6 By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported, and unregulated fishing and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation*

14.7 By 2030, increase the economic benefits to small island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism.

14.a Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries.

14.b Provide access for small-scale artisanal fishers to marine resources and markets.

14.c Ensure the full implementation of international law, as reflected in the United Nations Convention on the Law of the Sea for States parties thereto, including, where applicable, existing regional and international regimes for the conservation and sustainable use of oceans and their resources by their parties

14.1.1 (a) - Coastal eutrophication.

14.1.1 (b) - Marine Debris.

14.2.1 - Marine Area Management.

14.5.1 - Protected Areas and conservation.

**Taking into account ongoing World Trade Organization negotiations, the Doha Development Agenda and the Hong Kong ministerial mandate.*

Use of Existing UN Databases Reference

The existing databases referred are based on two criteria. First, they had to provide data that responded closely to the established UN indicator for the 152 coastal states or the majority of them to allow comparison between countries (Table-1). As the list of coastal states differed slightly between databases, the list of 152 coastal states in the IUU Fishing

(http://www.iuufishingindex.net) / (Macfadyen and Hosch, 2021) (used to assess SDG 14.6) was chosen. The list was also fully covered in the World Database on Protected Areas (WDPA) used to assess SDG 14.5. The analysis was closely aligned to what is suggested by various UN manuals on the four SDGs targets. Second, the databases chosen were established for at least three years to ensure that the data was not based on one-off assessments, that it has been used by others since and that it was updated since the adoption of the SDGs in 2015. For SDG 14.5 and 14.6, data until 2020 was available. For SDG 14.2 and 14.4, the two databases of choice held data until 2018. They were complemented by one other database respectively, providing data up to 2020.

ACRONYMS

ACRONYMS	DESCRIPTION Explanation and relevant policy instrument/organisation
EBSA	Ecologically or Biologically Significant marine Areas – Convention on Biological Diversity (CBD)
PSSA	Particularly Sensitive Sea Area – IMO
VME	Vulnerable Marine Ecosystem - FAO
WHS	World Heritage Site - UNESCO
Ramsar	Ramsar Sites (Wetlands of International Importance) – Convention on Wetlands of International Importance (Ramsar Convention)

IBA	Important Bird and Biodiversity Areas – Bird Life International
KBA	Key biodiversity Areas – IUCN, Birdlife International, Plant-Life International, Conservation International, Critical Ecosystem Partnership Fund and others (Note: KBA include IBAs and AZE Sites)
Natura 2000	European network of protected sites under the European Habitats and Birds Directives - EU
AZE Sites	Alliance for Zero Extinction Sites - Alliance for Zero Extinction
GESAMP	Guidelines for Monitoring and Assessment of Plastic Litter in the Ocean

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AUTHORS

Dr Jai Acharya is Principal Consultant at International Maritime Management & Consultancy (IMMC) and Director at International Ocean Institute (IOI) and IOI Ocean Academy, Singapore

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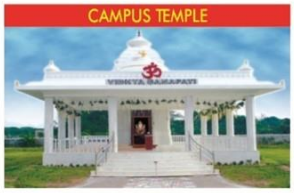

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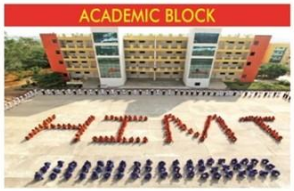

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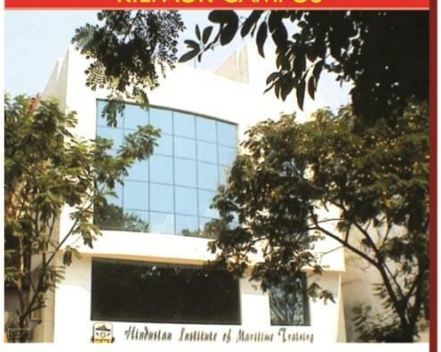

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A Divsion of Inner Search Foundation
410 Gemstar Commercial Complex, Ramchandra Lane Extension, Kachpada,
Off Link Road, Malad (W), Mumbai- 4000 64, India.
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