



THE EFFORTS OF SPECIALIZED INTERNATIONAL ORGANIZATIONS IN SUPPORTING THE
TRANSFER OF MARINE RENEWABLE ENERGY TECHNOLOGY TO DEVELOPING COUNTRIES'
EXCLUSIVE ECONOMIC ZONES: THE CASES OF IMO AND IRENA

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RENEWABLE ENERGY TECHNOLOGY TO DEVELOPING
COUNTRIES' EXCLUSIVE ECONOMIC ZONES: THE CASES OF IMO
AND IRENA**

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Abstract:

The contribution of international organizations to promoting the transfer of marine renewable energy technologies to developing countries in their Exclusive Economic Zones (EEZs) is an indispensable aspect in moving forward with sustainable energy solutions around the world. This analyzes the role of two major organizations, the International Maritime Organization (IMO) and the International Renewable Energy Agency (IRENA), in driving sustainable energy in these countries. It investigates legal frameworks and institutional mechanisms developed by these organizations to support the effective deployment of marine renewable energy technologies, with particular attention to the challenges and opportunities faced by developing countries. By looking at both practical and legal aspects of these projects, the paper determines central hurdles and proposes solutions to enhance the effectiveness of international cooperation in this field. Based on the study, cooperative multi-organizational action backed by strong legal frameworks is vital to ensuring long-term progress in transferring marine renewable energy solutions.

Keywords: IMO; IRENA; Specialized international organizations; technology transfer; marine renewable energy; exclusive economic zone; developing countries.

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Introduction:

The Exclusive Economic Zones (EEZs), under the definitions of the United Nations Convention on the Law of the Sea (UNCLOS),¹ are sea areas bordering and off-shore from a state's territorial sea up to a point 200 nautical miles from a state's baselines.² Coastal states hold sovereign rights in these areas for exploring, managing, and exploiting living and non-living resources.³ These rights also include the production of energy from water, currents, and wind, as well as the establishment of necessary installations for the transfer of marine renewable energy technologies.

In light of the growing global interest in cleaner energy sources on a world basis, the role of EEZs has acquired greater strategic relevance, especially for developing nations seeking to capitalize on their untapped marine potential. However, realizing this potential remains contingent upon access to advanced technologies and institutional support, which are often limited or unevenly distributed.

Against this backdrop, marked by a complex interplay of promising opportunities and persistent challenges and stimulating opportunities, there exist specialized institutions that have positioned themselves uniquely to play a leading role in helping developing countries address this space. Among these, the International Maritime Organization (IMO) and the International Renewable Energy Agency (IRENA) have shown a growing commitment to facilitating the transfer of marine renewable energy technologies through dedicated legal frameworks, institutional initiatives, and broad-based strategic partnerships. Yet, with their varying types of roles and modes of intervention, there arise questions of first principle regarding their actual contribution to enabling capacity development and access in an equitable way: Do they genuinely function as enablers of capacity-building and equitable access for developing countries, or do they merely reflect and potentially reinforce existing global asymmetries?

**THE FIRST TOPIC: THE INTERNATIONAL MARITIME ORGANIZATION
(IMO)**

The IMO was established under the 1948 Convention on the International Maritime Organization and began its operations in 1959.⁴ Although the Convention does not explicitly address the transfer of marine renewable energy technologies to developing countries within their EEZs, it grants the IMO the authority to "promote and adopt the highest practicable standards in matters concerning maritime safety, efficiency of navigation, and prevention of marine pollution from ships." Based on this legal mandate, the IMO has gradually expanded its scope to include environmental initiatives, notably the promotion of renewable energy use in maritime transport—despite such issues not being part of its original agenda.⁵



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**FIRST REQUIREMENT: IMO LEGAL AND REGULATORY FRAMEWORK
FOR MARINE RENEWABLE ENERGY TRANSFER**

The IMO's efforts to advance marine renewable energy technology transfer are anchored in two key international conventions:

Firstly: The MARPOL Convention (1973) & Annex VI (1978)

The MARPOL Convention ranks amongst the key worldwide accords focused on the protection of the marine environment from ship-related pollution.⁶ Annex VI, adopted in 1997, imposed stringent environmental measures to control air pollution, prompting nations and business organizations to adopt green technologies, such as offshore wind power, to drive vessels and contain harmful emissions in normal operations. This Convention has contributed immensely to the drive behind innovation in maritime technology by encouraging the use of low-emission energy sources, thereby facilitating the transfer of these technologies to developing nations.

In addition, the Convention designated 19 so-called "Special Areas" in need of increased protection both due to environmental sensitivity and high maritime traffic, including the Mediterranean Sea, the Red Sea, the Baltic Sea, the Black Sea, and the southern coastal waters off South Africa. In these regions, stricter pollution control measures are imposed, and thus a support environment is created for the use of renewable marine energy technologies as a replacement for fossil fuels. Since numerous developing nations have coastlines in these regions, adopting marine renewable energy technologies is a strategic choice not only to ensure environmental compliance but also to promote security of supply and economic autonomy.⁷

Secondly: The London Convention (1972) & Protocol (1996)

The London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (LC 1972) and its 1996 Protocol are major environmental treaties that regulate the disposal of hazardous materials in the seas.⁸ While the Convention's mandate is not directly focused on "technology transfer," its regulative effects have positively contributed to the formation of a legal climate that favors the innovation and diffusion of marine renewable technologies in a variety of ways:

1- Environmental Requirements for Marine Renewable Energy Installations

London Convention, under Article 4(b), forbids dumping of hazardous waste without permission,⁹ which requires the nations and business enterprises that produce marine renewable energy technologies, like wind and wave power, to design facilities in a manner that complies with environmental standards. This comprises the choice of environmentally friendly coatings for offshore wind turbines in order to minimize chemical pollution.¹⁰ Such requirements ensure that these innovations are already in compliance with global environmental standards, which



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decreases environmental risks and increasing confidence among international donors and investors.

2- Uniform International Standards for the Installation and Operation of Marine Renewable Energy Technologies

The Scientific Group of the London Convention (LC-SG) issued environmental guidelines to prevent marine pollution, including those for the installation of platforms designed for complete removal at the end of their life cycle,¹¹ ensuring they can be reused or recycled, or disposed of in a way that minimizes environmental impact.¹² These guidelines contribute to the harmonization of operational and design standards for marine renewable energy projects, reducing technical barriers for developing countries adopting these technologies.¹³

3- Precautionary Principle for Technology Development

The 1996 Protocol emphasizes pollution prevention during the design phase (Pollution Prevention through Design - PPD), indirectly encouraging manufacturers¹⁴ to adopt a precautionary approach,¹⁵ ensuring the use of best available clean production technologies,¹⁶ and applying waste prevention strategies.¹⁷ This has driven manufacturers to integrate sustainability criteria into new technologies, such as recyclable offshore wind turbines.¹⁸ Thus, when these technologies are exported to developing countries, they are already subjected to rigorous environmental testing and embedded with sustainable solutions, facilitating their market entry without regulatory concerns and narrowing the technological gap between developed and developing countries in the field of clean energy.

SECOND REQUIREMENT: IMO INITIATIVES AND PROGRAMS FOR SUPPORTING MARINE RENEWABLE ENERGY TRANSFER

The IMO's efforts have aimed at facilitating the transfer of offshore renewable energies' technologies by promoting a series of initiatives and programs, including the provision of technical and financial assistance.

Firstly: Global Maritime Energy Efficiency Partnerships (GloMEEP)

To address the increasing environmental problems, the IMO started the GloMEEP initiative in 2015, in cooperation with the Global Environment Facility (GEF) and the United Nations Development Programme (UNDP). The program seeks to promote ship energy efficiency and decrease greenhouse gas emissions, with the aim of supporting the use of offshore renewable technologies by developing nations. This is achieved through legal and regulatory frameworks, training programs, and pilot projects that build local capacity and encourage public-private collaboration.¹⁹ To facilitate adoption, GloMEEP focused on removing key barriers by:



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1- Legal and Institutional Reforms

GloMEEP supported countries in developing national policies and legislation aligned with IMO regulations on ship energy efficiency. These efforts aimed to facilitate the integration of renewable energy sources, such as offshore wind, into the operation of ships and ports. They also included updates to national laws related to the design of new ships in accordance with the Energy Efficiency Design Index (EEDI) and the implementation of the Ship Energy Efficiency Management Plan (SEEMP), to ensure more sustainable vessel operations.²⁰

2- Training Programs and Pilot Projects

The initiative also promoted capacity-building and technology transfer to developing countries through training workshops, held in the Philippines²¹ and South Africa in 2017,²² Georgia in 2016,²³ and Argentina in 2017,²⁴ focusing on energy-efficient ship design and the implementation of MARPOL Annex VI strategies.²⁵

In the same year, as part of the GloMEEP initiative, the IMO launched the Global Industry Alliance to Support Low Carbon Shipping (GIA). This alliance brings together leading maritime industry stakeholders from both the public and private sectors, including companies such as ABB, Maersk, Bureau Veritas, DNV GL, Grimaldi Group, and Shell. Its aim is to advance technological research and development, pilot new energy efficiency technologies, and provide technical support to developing countries in adopting renewable energy solutions for maritime transport.

While GloMEEP has achieved notable success, it has also faced several challenges that have hindered the transfer of offshore renewable energy technologies to the development context, including disparities in the maritime infrastructure, whereby many of the ports in the development context are not well-fitted to handle advanced technologies, and a lack of funds, where the viability of the project heavily relies on ongoing financing. Moreover, private investment remains limited due to the risks associated with emerging technologies.²⁶ Despite these challenges, GloMEEP is one of the best examples of the effective transfer of technology to the development context in the manner of a robust pilot project.

Secondly: The Global Maritime Technology Cooperation Centers Network (GMN)

Launched in 2016 and funded by the IMO and the European Union and the GMN is one of the top initiatives²⁷ to promote the transfer of offshore renewable energy technologies in the EEZs. at promoting the transfer of offshore renewable energy technologies within EEZs. It focuses particularly on developing countries, especially least developed countries (LDCs) and small island developing States (SIDS), which face significant challenges in accessing modern technologies due to limited resources.²⁸ In order to meet its goals in these markets, the GMN project set up a worldwide network of five Maritime Technology Cooperation Centers (MTCCs) across Africa, Asia, the Caribbean, Latin America, and the Pacific.²⁹ These Regional hubs enable



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technology transfer and low-carbon shipping under pilot projects aimed at increasing ships and port energy efficiency.³⁰

One of the major activities conducted by the GMN project was the undertaking of pilot energy management initiatives by MTCC-Pacific in the seven nations involved. This encompassed carrying out energy audits and the gathering of baseline data on the use of port energy, the purpose being to submit short- and long-term energy-saving initiatives to help decrease the GHG emissions emanating from port activities.³¹ The GMN project also assisted in the formulation of significant initiatives, including:

In 2019, a groundbreaking wave power project was commenced in Ghana, whereby Seabased entered a deal with the company TC's Energy of Ghana to develop a 100 MW wave power plant in the vicinity of the city of Ada. The project aims to test the technical and commercial viability of wave-to-electricity conversion, with plans for local component manufacturing and job creation, contributing to knowledge transfer and improved marine infrastructure.³²

The use of advanced satellite-based remote sensing, utilizing instruments like the Global Wind Atlas,³³ in partnership with institutions like DTU Wind, visualized the wind flow patterns.³⁴ They facilitate the identification of the best areas of offshore wind farm installation and supply sound data to policymakers and investors regarding the potential of the renewable energy of the EEZs.

Due to the success of its first phase, a second phase of the GMN project was launched in 2023 with an additional €10 million in EU funding. It addresses scaling up activities in the five MTCCs, upscaling pilot projects at larger scales to deliver measurable reductions in emissions, deepening public-private partnerships, and boosting the infrastructure of offshore renewable energies in the developing nations.³⁵ It builds upon the first phase, which focused on developing institutional capacities and implementing small-scale initiatives, thereby further supporting the IMO's objectives of reducing greenhouse gas emissions through the deployment of available technologies.

Thirdly: Coordinated Action to Reduce Emissions from Shipping (IMOCARES)

In 2023, the IMO launched the 'IMOCARES' project in partnership with the Kingdom of Saudi Arabia. This international project is intended to support Small Island Developing States (SIDS) and Least Developed Countries (LDCs) in the uptake of market-available technological options in order to increase the energy efficiency of shipping and ports, decrease operational expenditures, and decrease greenhouse gas (GHG) emissions. This project focused in particular on enhancing Global North-South technological cooperation by promoting technology partnerships, assisting in the roll-out of pilot projects of sustainable maritime technology, and supporting up-to-the-minute knowledge exchange in the maritime shipping sector.³⁶

The IMO sees the mitigation of shipping's GHG emissions as a strategic imperative, given that the sector currently generates around 4% of global GHG emissions. Domestic shipping, in turn, is a prime target area, as it is responsible for nearly 30% of all shipping emissions. This serves to underscore the need to step up the use of renewable technology in the sector to deliver on global climate objectives.³⁷

In this context, a new IMOCARES report published in 2025 highlighted that domestic shipping in Africa and the Caribbean accounts for 26.2% of global shipping emissions. The



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report called for the development of dedicated national action plans, including the transformation of ports and EEZs into clean energy hubs, as well as the strengthening of cooperation between governments and technology providers. It also recommended the adoption of innovative financing mechanisms and the implementation of tailored training programs to support developing countries in deploying renewable technologies such as floating solar power, shore-side energy, battery systems, and wind-powered ship propulsion.³⁸

After the success of its first phase, the IMO rolled out a second phase of the IMOCARES project to further assist developing nations in the uptake of offshore renewable energy technologies. In this new phase, the project centers on enhancing dialogue and engagement of technology providers with developing states under the 'CARES Connects' workshops, identifying country-level challenges and proposing technology-specific solutions under the 'Global Challenge II' program, and publishing extensive reports to aid in the decarbonization of the developing regions.³⁹ Through these efforts, IMOCARES contributes to a just transition toward a green maritime industry, emphasizing climate justice and empowering developing countries to sustainably manage their resources within their Exclusive Economic Zones. The initiative also reflects the IMO's broader commitment to achieving Sustainable Development Goal 7 (SDG 7), which calls for access to affordable, reliable, sustainable, and modern energy for all.⁴⁰

THE SECOND TOPIC: THE INTERNATIONAL RENEWABLE ENERGY AGENCY (IRENA)

IRENA came into existence in 2009 under its Statute, and the mission of the Agency is to facilitate a transition to a low-carbon economy by facilitating the extensive and sustained use of renewable energy sources. Its Statute also underlines the role of knowledge and technology transfer and assigning the Agency a central role in assisting its Member States, particularly developing countries, in accessing cutting-edge technologies and strengthening their capacities in the renewable energy sector.⁴¹ Today, IRENA stands as the global hub in the field, assisting nations in the transition to renewable energy by way of advanced data, technologies analysis, and assistance in sustainable investments. Comprising 160 Member States and the European Union, the Agency plays a strategic role in informing global energy policies.⁴²

FIRST REQUIREMENT: IRENA'S LEGAL AND REGULATORY FRAMEWORK FOR MARINE RENEWABLE ENERGY TRANSFER

IRENA has defined its pivotal in the facilitation of the transfer of marine renewable energy technologies in a web of legal and legislative instruments, starting initially with its constituting Statute and progressing up to the Memoranda of Understanding entered into with a variety of international partners.

Firstly: Statute of IRENA (2009)

The Statute of IRENA affirms the Agency's role in promoting the transformation to clean, renewable energy, including marine-related sources, as a fundamental pathway to sustainable



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development. It emphasizes the role of these types of energy in environmental protection, security of energy supply, and economic development, especially in the developing nations.⁴³ Based on its role as a center of excellence in renewable energy globally, the Agency is responsible for keeping track of and analyzing best practices in the renewable energy sector, facilitating financing and investment opportunities, and mobilizing research and development of marine energies like wave, tidal, and floating solar power. This helps the developing nations harness their marine resources in a sustainable manner.⁴⁴

For the realization of these objectives, IRENA seeks to intensify international cooperation by partnering with governments, international organizations, and financial institutions in strategic partnerships. It aims to facilitate technology transfer and support marine renewable energy projects, particularly within the EEZs of developing nations.⁴⁵ It also supplies the nations with technical and advisory policy support and endeavours to mobilize resources in partnership with the institutions of donors. These initiatives promote project sustainability and the solution of common problems like the lack of technological capabilities and fewer funds available to the projects in development.⁴⁶

In addition, IRENA also aims at promoting awareness of the potential of marine renewable energies by creating research reports, publishing specialized studies, and holding conferences and workshops that unite policymakers, investors, and technical professionals to facilitate the utilization of these technologies.⁴⁷ In order to achieve its goals efficiently, the Agency is focused on the allocation of resources in response to the requirements of the developing, island, and remote areas in an effective manner, while avoiding redundancy by coordinating its efforts with the pertinent international organizations. This method maximizes the use of resources and facilitates the effective and efficient implementation of marine energies projects.⁴⁸

Secondly: Memoranda of Understanding (MoUs)

Among the Memoranda of Understanding signed by IRENA to facilitate the transfer of marine renewable energy technology, the following are noteworthy:

1- Memorandum of Understanding between IRENA and the United Nations Framework Convention on Climate Change (UNFCCC)

This MoU of Understanding is a strategic step in enhancing the transition to renewable energy as a leading solution to climate change. Adopted in August of 2019, the agreement seeks to facilitate the sharing of knowledge on clean energy policies and transitions, strengthen capacity building, especially in the form of intense training sessions in the developing nations, and facilitate the transfer of renewable technologies as useful instruments of carbon emission reduction. The MoU also includes coordination in relevant international forums, such as the Climate Change Conferences (COP 25 and COP 26), to strengthen collective action in this field.⁴⁹

In practical terms, collaborative work by IRENA and the UNFCCC involves the hosting of expert workshops and the issuance of scientific reports on renewable energy and the provision of specialized programs of training that will enable the empowering of developing nations in accessing clean technology, including marine renewable technology. Global climate action efforts that mobilize cities, regions, the private sector, and investors in the transition to a clean



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economy are also supported by IRENA, thus promoting increased regional work in renewable technologies and new opportunities in the use of resources in the EEZs.

In doing so, UNFCCC's Executive Secretary, Patricia Espinosa, underlined that the transition to a low-carbon economy is no longer a decision but a pressing need in the context of intensifying climate crises. She underlined that renewable power is the best solution to prevent catastrophic climate situations. IRENA's Director-General, Francesco La Camera, confirmed that the cost of technology's ongoing decrease places renewable power at the center of decarbonization efforts, boosting the potential of developing nations to embrace low-carbon alternatives, including the use of marine renewable energy.⁵⁰

2- Memorandum of Understanding between IRENA and the United Nations Industrial Development Organization (UNIDO)

The Joint Declaration was signed at the United Nations Climate Change Conference (COP27) in 2022 to promote the transition to renewable energy and innovation, particularly in green hydrogen. This partnership between IRENA and UNIDO emphasizes knowledge sharing, building technical capacities, and mobilizing clean energy investment in the developing nations. In this context, the Director-General of UNIDO, Gerd Müller, noted that the growth of renewable energy is a strategic opportunity for the developing nations, and including those of the marine-rich nations, to achieve sustainable industrial development and create new jobs.⁵¹

Under this declaration, UNIDO and IRENA collaborate to launch training programs, technical assistance, and incentive policies empowering the developing nations to tap their ocean potential and promote the integration of high-technology in coastal industries. This accelerates a just and equitable transition to clean energy.

SECOND REQUIREMENT: IRENA'S STRATEGIC PARTNERSHIPS FOR TECHNOLOGY TRANSFER

As part of its efforts to promote transfer of marine renewable energy technologies to the developing nations, the IRENA established strategic alliances with national governments to facilitate the transition to renewable energy. Some of the foremost of such alliances are:

Firstly: Partnerships with Governments

IRENA conducted its engagement in diverse governments to facilitate marine renewable energy development, tailoring its approach to the specific context of every country. Prominent examples are:

1- Partnership with the Government of Singapore

In support of the maritime industry's transition to renewable power, IRENA and Maritime and Port Authority of Singapore (MPA) signed a Memorandum of Understanding on 22 October 2024. Through the signing of the MoU, the decarbonization of shipping and port operations will be expedited through knowledge sharing, infrastructure development, and institutional



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cooperation. As part of the agreement, personnel from MPA will be seconded to IRENA to facilitate the exchange of expertise in designing and implementing marine renewable energy solutions. Teo Eng Dih, CEO of MPA, emphasized that the agreement facilitates the sharing of best practices and the development of capacities in the capabilities of the developing nations, thereby enhancing of maritime decarbonization efforts.⁵²

2- Partnership with the Government of Germany

Reflecting its global commitment to the renewable energy transition, the Government of Germany partnered with IRENA in 2011 to establish the IRENA Innovation and Technology Centre (IITC) in Bonn. The Centre serves as a hub for developing technological solutions that promote clean energy, particularly in developing countries. It supports energy policy analysis, provides technical advisory services, and designs financial mechanisms to accelerate innovation and technology transfer, including in the field of marine renewable energy.

During the Centre's inauguration, former Environment Minister Norbert Röttgen described the global expansion of renewables as a geopolitical priority, emphasizing the importance of supporting developing countries to ensure global energy equity. Former IRENA Director-General Adnan Amin noted that the Centre serves as a scientific and advisory hub for governments, accelerating innovation and the energy transition. Germany allocates €2–3 million annually to the Centre, along with \$1.3 million for IRENA activities, demonstrating its sustained commitment to the global energy transition and the transfer of technology to developing countries.⁵³

3- Partnership with the Government of Japan

To build the capacity of developing countries to adopt marine renewable energy technologies, IRENA partnered with Japan in 2017 to deliver training programs and technical workshops for Small Island Developing States (SIDS) and Pacific Island countries.⁵⁴ These initiatives, held in nations such as the Maldives, Saint Martin, Tonga, and Cuba, focused on enhancing technical expertise and addressing the integration of variable marine renewable sources into local energy systems. A separate workshop in Fiji, co-hosted with the U.S. and Japan, explored innovative financing tools to accelerate the energy transition in developing countries.⁵⁵

This collaboration reflects IRENA's commitment not only to technology transfer but also to human resource development and infrastructure support, which are key pillars for achieving a sustainable transition to marine-based clean energy.

Secondly: Partnerships with International Organizations

IRENA has formed strategic partnerships with diverse governmental and non-governmental stakeholders facilitating the transition to marine renewable energy. Some of the important partnerships include:



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1- Partnership with IMO and the United Nations Conference on Trade and Development (UNCTAD)

In efforts to decarbonize the maritime transport sector and enhance renewable energy production in developing nations, IRENA joined the United Nations Climate Change Conference (COP27) in November 2022, together with the IMO and UNCTAD. They co-organized a side event, "Future Maritime Fuels: Renewable Energy Production Opportunities in Developing Countries".⁵⁶ It was a forum in which the contribution of marine renewable energies in the development stage in the production of clean fuels in the global shipping business and the strategies to increase investment in high technology were the central theme of the debates, and the conference emphasized the need to empower the development stage nations to use their marine resources in the production of sustainable energy, thus supporting a just transition towards a low-carbon economy. It also asserted the role of technological innovation to bring marine renewable energies in line with marine transport requirements, promote technology transfer, and enable the transformation of the global energy landscape.⁵⁷

2- Partnership with the Global Wind Energy Council (GWEC)

In November 2020, IRENA and the Global Wind Energy Council (GWEC) formed a partnership aimed at removing legal, regulatory, and financial barriers to the expansion of offshore wind projects, particularly within the EEZs of developing countries. Through the Climate Investment Platform, the partnership strives to mobilize project financing and increase the role of the developing nations in the renewable sector by opening the market to more players. It also promotes industrial engagement in policy dialogues and investments that create favorable conditions for technology transfer, enabling the adoption of advanced offshore wind technologies. Additionally, the development of open-source project models helps reduce legal and regulatory risks, increasing the attractiveness of such projects to foreign investors, as emphasized by IRENA's Francesco La Camera and GWEC's Ben Backwell.⁵⁸

3- Partnership with Ocean Energy Europe (OEE)

In December 2020, IRENA signed a Memorandum of Understanding (MoU) with Ocean Energy Europe (OEE) in Brussels to promote the commercialization of marine energy technologies. With the aim of creating political incentives and new business models, the partnership seeks to support the use of underutilised marine resources by developing countries, especially nations with extensive EEZs, in their renewable transition. With reports by IRENA, the technologies could play a central role in the transition of the energy sector to become low-carbon, enhance electricity access, and increase the use of marine energies in shipping, cooling, and desalination.⁵⁹ The success of this initiative relies on the establishment of appropriate regulatory frameworks and increased investment in research and development. Currently, global marine energy capacity stands at 530 MW, and is set to increase to 3 GW in the next five years. At favorable policies and financial incentives, capacity could rise to as high as 10 GW by the year 2030, providing feasible energy solutions, especially to island nations, using tidal and wave technologies.⁶⁰



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4- Partnership with Small Island Developing States DOCK (SIDS)

IRENA partnered with SIDS DOCK, a collaborative platform for Small Island Developing States (SIDS), in order to discover and develop marine energy resources. On 5 November 2020, a Memorandum of Understanding (MoU) was signed in Abu Dhabi, where the Director-General of IRENA, Francesco La Camera, underscored that these nations have extensive marine energy resources that can fuel resilient and sustainable economies. Ronald J. Jumeau, the Chairperson of the SIDS DOCK Executive Council, added that the collaboration will support the exchange of data, the establishment of policy frameworks, and the mobilization of finances to promote marine energy technologies in support of the efforts of sustainable development and renewable energy in the development nations.⁶¹

5- Partnership with the Global Renewable Energy Alliance (GRA)

IRENA has augmented its work in marine renewable energy technology transfer through a partnership agreement with GRA, which facilitates the elimination of barriers to the large-scale development of these technologies. This effort helps support the efforts of policymakers in overcoming obstacles to renewable energy development, and especially in the developing world, in harnessing their marine renewable resources in their EEZs.⁶²

This partnership of IRENA and GRA is noteworthy, in that it mobilizes the principal organizations directly involved in the transfer of technologies in the marine renewable sector. These organizations include the Global Wind Energy Council, Global Solar Energy Council, International Hydropower Association, International Geothermal Energy Association, Long Duration Energy Storage Council, and Green Hydrogen Organization. This diversity of expertise in the partnership opens up wide opportunities to drive innovation in marine energy—from offshore wind developments through the development of wave and ocean thermal technologies. This was evidenced at COP28, where these matters were given priority, and tangible commitments were made to accelerate development in the sector.⁶³

Thirdly: Partnerships with Financial Institutions

In order to promote the transfer of marine renewable energy technologies to the EEZs of the developing nations, IRENA has formed strategic partnerships with many of the primary financial institutions that provide backing to such schemes. Prominent partnerships include:

1- Partnership with the Caribbean Development Fund (CDF)

In 2020, the Caribbean Development Fund (CDF) and IRENA signed a Memorandum of Understanding (MoU) to facilitate the transformation of Caribbean Small Island Developing States to a low-carbon, green economy. This collaboration will facilitate the deployment of renewable energy technologies and increase the energy efficiency in the EEZs of these nations. In this context, CDF CEO Rodinald Soomer emphasized that the collaboration seeks to mobilize resources and strengthen both technical and financial support for sustainable energy projects, particularly through the Credit Risk Abatement Facility (CRAF). IRENA Director-General



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Francesco La Camera added that the initiative facilitates improved conditions and faster integration of marine renewables, hence supporting sustainable development.⁶⁴

2- Partnership with the Inter-American Development Bank (IDB)

On February 9, 2021, IRENA signed a strategic partnership agreement with the Inter-American Development Bank (IDB) to facilitate the transition of the region's energy in line with the Paris Agreement and the 2030 Agenda of Sustainable Development. The partnership focuses on knowledge exchange and scaling up investments in renewable energy, including marine technologies, by using the financing platforms of both institutions, the Climate Investment Platform of IRENA and the Energy Hub of the IDB. It seeks to establish a favorable climate of investment in the development of renewable marine energy projects in the coastal areas of the region's developing nations. IDB President Mauricio Claver-Carone emphasized that the agreement is crucial in initiating a green and sustainable recovery. It is a reaffirmation by the IRENA Director-General, Francesco La Camera, that more access to finance for sustainability is necessary in order to facilitate the accelerating of the transitions of the energy, including in marine renewables, in the coastal developing nations of the region.⁶⁵

3- Partnership with the Asian Infrastructure Investment Bank (AIIB)

On September 21, 2021, the Asian Infrastructure Investment Bank (AIIB) and IRENA formed a partnership focused on promoting the development of renewable energy in Asia, highlighting in particular the mobilization of private capital. AIIB, since its launch, has agreed to invest \$1.25 billion to develop 12 renewable energy projects, including marine, in Egypt, India, the Maldives, Oman, Pakistan, and Turkey, respectively. It also invested \$500 million to fund sustainable energy projects through intermediary financial institutions. AIIB also committed to raising climate financing up to 50% of the total investments by 2025 and reaffirming its support of the Paris Agreement goals.⁶⁶

4- Partnership with the Abu Dhabi Fund for Development (ADFD)

Following the period since 2016, the Abu Dhabi Fund for Development (ADFD) has deepened its cooperation with IRENA to direct \$350 million in support of renewable energy projects in the developing nations, including marine renewable projects in their EEZs. It also contributed \$6 million in technical and administrative support to refine project assessment and efficiency.⁶⁷ This collaboration has so far funded a total of 32 projects in 26 nations, worth \$333 million, that promote the use of developed marine renewable technology and support the transition of the developing nations to a system of clean and renewable energy.⁶⁸

fourthly: Partnerships with the Private Sector

As the worldwide momentum towards energy transition accelerates, collaboration between the private sector and international organizations becomes instrumental in promoting technology transfer and financing sustainable energy projects. In this regard, numerous private entities have played a pivotal role in cooperating with IRENA to promote the deployment of marine



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renewable technologies in developing nations by sharing knowledge and consolidating the financial arrangements required in implementing viable projects.

In the past few years, a series of initiatives to aid in the achievement of this vision have included successive rounds of financing in renewable energy, and more specifically, in marine energy. These initiatives have offered meaningful opportunities to increase the use of these technologies in developing countries.⁶⁹ Further resources have also gone towards the development of managerial and technical capacity, enhancing the quality and effectiveness of the projects and the realization of the intended effect.⁷⁰

Moreover, the private sector has become increasingly engaged in the renewable energy transition through strategic alliances partnerships to overcome investment obstacles and ensure enhanced collaboration between parties. International coalitions are doing the work of lowering carbon intensities and scaling up green production, directly boosting the development of marine renewable technologies.⁷¹ Agreements of collaboration have been entered into by top players including Siemens Energy, Enel Green Power, TAQA Arabia, Eni, Technip Energies, EDF Renewables, JSW, Tata Steel, Sable Chemicals, Repsol, Equinor, and TAQA. These collaborative efforts are pushing innovation and helping the nations of the developing world achieve a more sustainable transition in the energy sector.⁷² With these alliances, the private sector is a core partner in the provision of clean energy solutions, expediting the transfer and diffusion of marine renewable technologies in the EEZs of the nations.⁷³

THIRD REQUIREMENT: IRENA Initiatives and Programs for Marine Renewable Energy Transfer

IRENA has also emphasized facilitating the transfer of marine renewable energy technology by means of a variety of innovative programs and initiatives meant to speed the transition to the use of clean energy. This involves international initiatives aimed at capacities building in the developing nations while at the same time offering both technical and financial assistance.

Firstly: Global Offshore Wind Alliance (GOWA)

The GOWA is one of the foremost initiatives to boost the deployment of offshore wind globally. Launched jointly by IRENA, the Global Wind Energy Council (GWEC), and Denmark, the partnership joins the COP28 goals of having a triplication of renewable power by the year 2030. It aims to mobilize political will and increase global cooperation in order to assist developing nations in unleashing untapped offshore wind resources available in their EEZs, while harmonizing industrial development and marine ecosystem protection.⁷⁴

Notwithstanding the high growth rate of the offshore wind market, as the statistics of IRENA show, numerous developing nations are still confronting a number of difficulties, first and foremost of which is the lack of financing, weak regulative frameworks, and limited technical capabilities. GOWA, in order to overcome these barriers, targets the development of strategic partnership relations between the developed and the developing nations, knowledge transfer, building up capacities, and the embracing of new types of financing, including the blended finance and public-private partnerships. These activities decrease the risks of investments and broaden the scope of offshore wind projects. In doing so, the Alliance becomes a global site of the coordination of efforts and the development of regulative policies targeted at the integration



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of offshore wind energy into the economy of the developing nations, enhancing the security of their energy supply and creating new opportunities for the development of a sustainable economy.⁷⁵

Secondly: SIDS Lighthouse Initiative

In response to requests from the Small Island Developing States (SIDS) to strengthen international cooperation in the deployment of marine renewable technologies of wind, wave, and ocean thermal energies as a substitute to the use of fossil fuels in their EEZs, the SIDS Lighthouse Initiative was launched in 2014 at the UN Climate Summit. It provides support in the development of legal and technical frameworks, advises on expert matters, and facilitates the provision of finances.⁷⁶

Activities have ranged from resource studies in the SIDS, including renewable-powered desalination in Cape Verde and Kiribati, and integration of wind farms offshore in the Cook Islands, Antigua, and Samoa. The program also facilitates the development of Renewable Energy Islands Roadmaps (RE-Islands Roadmaps), which aid in the design of national marine technology transfer policies.⁷⁷

The program passed its original targets three years in advance, having raised USD 500 million in funding for marine renewable technologies, commissioned 100 MW of floating solar and 20 MW of offshore wind, and promoted the development of ocean thermal and hydropower technologies. Following this achievement, it seeks to reach a combined cumulative capacity of 10 GW in Small Island Developing States (SIDS) by 2030, paving the way for a strategic partnership in the field of energy action by IRENA and the Alliance of Small Island States (AOSIS).⁷⁸

Thirdly: Global Solar and Wind Atlas Initiative

Released at the third Clean Energy Ministerial (CEM3) in London in 2012, the Global Solar and Wind Atlas is a collaborative online GIS platform to estimate global renewable energy potential and is a web-based decision-support instrument to identify suitable locations for the development of marine renewable energy projects and to facilitate informed investment considerations in developing nations.⁷⁹

Evaluation of marine resource potential is crucial in the development of enabling environments for technology transfer and necessitates accurate data on wind, currents, and solar radiation. In this regard, the Atlas supplies high-quality, publicly available maps prepared by top-research-institution partners,⁸⁰ facilitating comparative analysis of marine renewable potential in developing nations.

This helps governments and policymakers formulate integrated strategies, target investments in high-potential zones,⁸¹ and mitigating financial risks, thereby enhancing the sector's competitiveness. As a decision-support instrument at global, regional, and national levels, the Atlas facilitates renewable energy project siting both onshore and offshore, supports infrastructure planning, and underpins market-oriented policies.⁸²



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Conclusion:

Transfer of renewable marine technologies to the EEZs of the developing nations is a critical nexus of environmental sustainability, technological advancements, and economic development. As the global transition to the use of clean energy continues to intensify, specialized international institutions have become prime movers by creating legally sound frameworks, enhancing strategic alliances, and initiating innovative ventures to narrow the technological gap. Joint actions by the IMO and IRENA serve to underscore the increased awareness that marine-based energy accessibility is not only a commercial opportunity but also a cornerstone of the global climate action agenda.

This convergence of law, policy, and technological cooperation is a manifestation of the dynamic character of international governance in an era of rapid transformation in the energy sector. Despite the progress so far, many challenges exist, including the barriers imposed by regulation and budget constraints. As developing nations attempt to increase their ability to exploit marine resources in their EEZs, institutional cooperation becomes more imperative than ever before. In this regard, the development of a just, coherent, and inclusive system of transfer of marine renewable technology is not just a policy aspiration but a collective obligation which will define the future of sustainable development and set the tone of coastal economies in the context of climate change.

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