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Blueprint for Sustainable Development: UNIDO's Blue Industry Contribution to the Blue Economy Agenda

A CONCEPTUAL FRAMEWORK

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Vienna, Austria
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ABBREVIATIONS

ADF	African Development Fund
AFS	Agreement on Fisheries Subsidies
ASEAN	ASEAN: The Association of Southeast Asian Nations
BI	Blue Industry
COP	Conference of the Parties
FAO	Food and Agriculture Organization
GHG	Greenhouse gas
GSSI	Global Sustainable Seafood Initiative
GVA	Gross Value Added
IEA	International Energy Agency
IGAD	Intergovernmental Authority on Development
IMO	International Maritime Organization
IoT	Internet of Things
IUCN	International Union for Conservation of Nature
IPCC	Intergovernmental Panel on Climate Change
IOC	Intergovernmental Oceanographic Commission
IUU	Illegal, Unreported, and Unregulated fishing
IRENA	International Renewable Energy Agency
ISA	International Seabed Authority
ISID	Inclusive and sustainable industrial development
LDCs	Least Developed Countries
mCDR	Marine Carbon Dioxide Removal
MICs	Middle-Income Countries
MPA	Marine Protected Area
NOAA	National Oceanic and Atmospheric Administration
NGO	Non-Governmental Organization
ORRAA	Ocean Risk and Resilience Action Alliance
OTEC	Ocean Thermal Energy Conversion
R&D	Research and Development
SADC	Southern African Development Community
SDG	Sustainable Development Goals
SIDS	Small Island Developing States
SME	Small and Medium Enterprises
UN	United Nations
UNCLOS	UN Convention on the Law of the Sea
UNCTAD	UN Conference on Trade and Development
UNEP	United Nations Environment Programme
UNEP FI	UNEP Finance Initiative
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
WEF	World Economic Forum
WMO	World Meteorological Organization
WRI	World Resources Institute
WTO	World Trade Organization

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DIRECTOR GENERAL'S FOREWORD

The Blue Economy is essential to sustainable economic and industrial development worldwide. For this very reason, I am very glad to introduce UNIDO's efforts in this field. The Blue Economy presents vast opportunities. They span traditional sectors such as fisheries, aquaculture, and marine tourism, as well as emerging industries like blue biotechnology, ocean energy solutions, and impact-driven blue finance. However, its full transformative potential remains largely untapped, requiring coordinated and strategic interventions to address environmental degradation, economic vulnerabilities, and technological gaps.

UNIDO has been at the forefront of advancing Blue Industry, which is an integral component of the Blue Economy, through proven methodologies and approaches that span across governance, innovation, trade, and technology transfer. These efforts are in line with UNIDO's mandate to foster inclusive and sustainable industrial development while also directly contributing to global the Agenda 2030 Sustainable Development Goals, the Paris Agreement on climate action, and the Beijing Declaration on women's rights. UNIDO's work serves to benefit the renewable energy transition, food security and resilient trade systems, which are the basis of prosperity and stability.

This publication provides a structured approach to unlock trade opportunities, mobilize innovative financial mechanisms, build capacities among blue-sector MSMEs, and maximize cross-sectoral linkages. Moreover, it highlights the role of circular economy approaches, resource efficiency, and ocean-based energy solutions in fostering sustainability, while ensuring economic viability for coastal and island nations, least developed countries, and small island developing states.

This publication is not just a call to action but presents a strategic blueprint for achieving a path forward for an inclusive and sustainable Blue Industry. UNIDO stands ready to collaborate with all partner governments, with the private sector, with financial institutions, and with international development partners, to mobilize new partnerships, technical cooperation projects and policy initiatives which will drive transformative change in the development of Blue Industry worldwide.

We look forward to turning commitments into action: for people, planet, and shared prosperity.

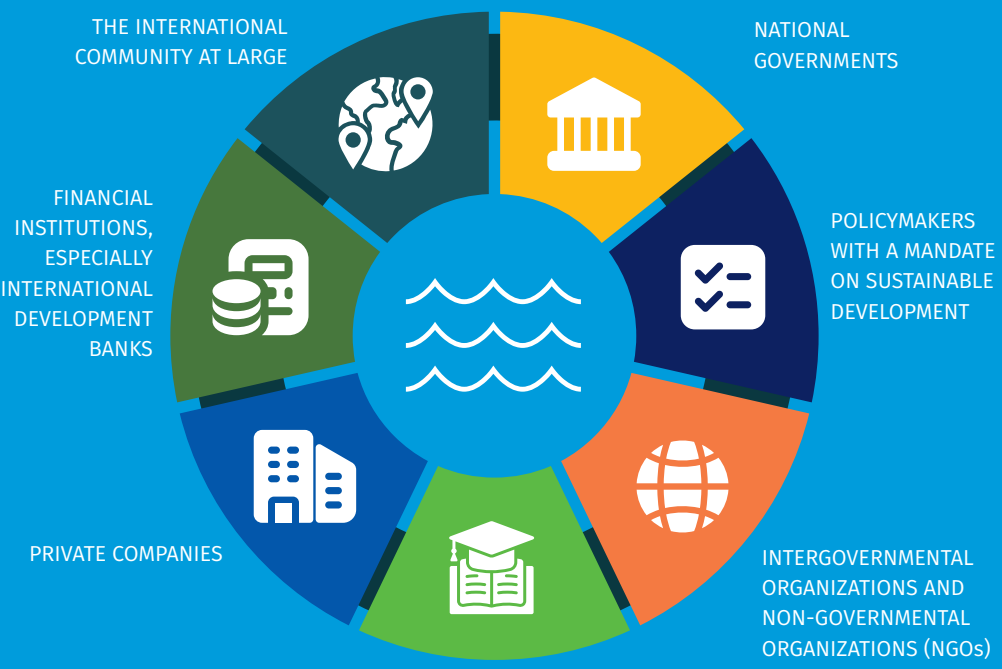
Gerd Müller

Director General
United Nations Industrial Development Organization

Speed read the essentials

WHO CAN MOST BENEFIT FROM THIS PUBLICATION?

UNIDO has recently coined the term Blue Industry to refer to "all traditional and emerging water-related productive activities, which contribute towards the enhancement of sustainable livelihoods, strengthening of industrial value chains, safeguarding of the environment and the facilitation and scaling up of innovation, thus positively addressing people, planet and prosperity." This publication represents a call for action, urging international organizations, countries, businesses, civil society and other stakeholders to embrace Blue Industry as an opportunity to accelerate the implementation of the Sustainable Development Goals (SDGs). As such, it is directed to all parties, whether in the public or in the private realm and regardless of scale of action (global, regional, national or local), that have an interest, mission or mandate in furthering the Blue Economy. More specifically, these potential parties include those listed below.



RATIONALE FOR THIS PAPER

In recent years the Blue Economy has gained increasing salience as a driver of stable industrial employment, as a means to safeguard the environment and create shared prosperity. If the ocean were a country, it would be the world's seventh-largest economy, providing goods and services worth at least US$2.5 trillion per year. The ocean's natural capital alone is valued at least US$24 trillion. Aquatic ecosystems make major contributions to all 17 SDGs, not just SDG14 (life below water). UNIDO, as the custodian agency for six industry-related indicators under SDG9, has been uniquely positioned to advance the sustainable development of Blue Industries for many years. However, the Organization recognizes the need for further Blue Economy progress and is therefore committed to deepening its development of sustainable industries within the Blue Economy context.

This report elaborates on UNIDO's Blue Industry contribution to the Blue Economy Agenda and proposes updates to UNIDO's future Blue Industry Programmatic Framework, including sectoral coverage, connections to the SDGs, UNIDO's contributions, and expected outcomes and overall impact. The paper also aims to highlight how a robust and flexible strategic framework should be adaptable to regional, national and local conditions. UNIDO's extensive experience, expertise and knowledge of Blue Industry means it can draw on organizational competencies such as capacity-building for sustainable and competitive value chains that should be systematically steered in order to materialize the Blue Industry's contribution to major global sustainability agendas, such as food security and ending hunger, climate action, the renewable energy transition, and sustainable trade and value chains.

Key takeaways for further discussion

- **There is growing recognition that the advancement of the Blue Economy can be a major driver of sustainable development, including the SDGs.** This is reflected in the rising momentum behind the creation of Blue Economy policies and strategies in countries and regions, notably the Small Island Developing States (SIDS), Least Developed Countries (LDCs), and Middle Income Countries (MICs).

- **The Blue Economy is under pressure from the intensifying triple planetary crisis of climate change, nature loss and pollution as well as resource depletion, while it provides a plethora of potential solutions as well.** The triple planetary crisis poses physical and transition risks to Blue Industry. It also offers opportunities to harness ocean-climate solutions such as ocean-based renewable energy and the blue food system, so as to better preserve or even restore ocean-based ecosystems.

- **Despite the huge potential of Blue Industries, the current development of such industries has not been sustainable and inclusive in many countries and regions.** Economic barriers include market access, investment gaps, and infrastructure. Social issues involve job creation, livelihoods, and gender inclusion, as well as a lack of collective bargaining or political power for coastal communities in political decision-making processes. Environmental concerns include pollution, climate change, destruction of aquatic ecosystems and unsustainable practices.

- **Blue Industry can have a positive impact on sustainable development in at least four ways.** First, it can chart a course for sustainable livelihoods and shared prosperity. Second, it can regenerate aquatic ecosystems and combat climate change. Third, it can nourish the world sustainably and equitably. And fourth, it can harness innovation and blue technologies.

- **Investments in sustainable Blue industrial transformation need to be large-scale, targeted and coordinated between the public and private sectors.** Large-scale sustainable Blue industrial development initiatives need significant domestic investments in infrastructure, but also significant private capital, FDI inflows and investment incentives to facilitate, for instance, the energy transition. This is particularly vital for the likes of SIDS and LDCs, which often lack capacity to fully realize the economic benefits of the Blue Economy, while also being prone to environmental degradation and natural disasters.

- **UNIDO's technical expertise, partnership mobilization capacity and mandate at large (particularly within the UN system, as the sole organization with a mandate to promote inclusive and sustainable industrial development) are well-aligned with the challenges that need to be addressed to harness the full potential of the Blue Economy.** This expertise enables the Organization to support sustainable development, blue industrialization, and innovation in water-based sectors, and to cooperate with other UN agencies and international partners to jointly address complex issues through collaborative approaches.

- **This report examines four key Blue Industry sectors (energy, blue food, tourism and recreation, and transport and trade) and four cross-cutting sectors (marine biotechnology, BlueTech, blue finance, and marine conservation).** Several nascent industries are emerging as challengers to established industries, including renewable ocean energy technologies, fish, shellfish and seaweed, nature-based tourism, sustainable shipbuilding, ocean data platforms, and impact investment. Blue Industry actors also need to be aware of the potential future trends such as floating wind/solar, regenerative aquaculture, and marine carbon dioxide removal.

- **UNIDO has developed a framework for advancing the Blue Industry, including a Theory of Change towards inclusive and sustainable blue industrial development.** The framework identifies several critical conditions to create an enabling environment for Blue Industry to thrive: strong governance and policies; industry competitiveness; market conditions and pull; and environmental and social equality and inclusion. The framework outlines UNIDO's essential contributions, including agenda-setting and convening (macro level), capacity-building and knowledge-sharing (meso level), and firm-level technical assistance, innovation and technology transfer (micro level).

- **UNIDO will build on its portfolio of proven methodologies and approaches that have been demonstrated by numerous Blue Industry projects.** The organization's work currently spans across 10 thematic and sectoral areas such as agenda-setting, good governance, cross-sectoral linkages, trade opportunities, blue food, blue innovation, circularity, ocean-based energy, private-sector capacity-building and innovative finance.

- **The report identifies several areas to expand UNIDO's future Blue Industry Programmatic Framework.** It recommends putting more emphasis on sectors such as tourism, marine biotechnology, shipping and ports, ocean data, and blue finance. It would also be useful to map UNIDO's Blue Industry initiatives and approaches onto SDG9 targets to identify any gaps.

- **The report also identifies wider systemic recommendations.** Strengthened cooperation with other Blue Economy stakeholders will be key to harmonizing and mainstreaming Blue Industry in Blue Economy fora and global development agendas as well as in key processes, such as blue finance standard-setting. UNIDO is also uniquely positioned to support countries and regions (notably in the SIDS, LDCs and MICs) in evolving their Blue Economy strategies and policies to include the opportunities provided by Blue Industry. The Organization should lead the process of connecting Blue Industry to global targets and solutions, such as the Sustainable Development Agenda, climate action (including net zero targets), nature restoration, pollution control, ecosystem preservation, food security, the energy transition, and sustainable value chains. It should create a systematic database of case studies and best practices to support knowledge transfer, knowledge-sharing and cross-sectoral linkages.

- **While this paper provides a global call to action, national and regional specificities with respect to capacities, priorities and resources should also be taken into account.** The outstanding regional priorities are summarized in a succinct manner below, based on the respective contributions to the 2024 UNIDO Expert Group Meeting, and are elaborated further in the Annex to this document.

  - **AFRICA:** Governance, interregional coordination, and the empowerment of youth and women in sectors such as fisheries, maritime transport, and renewable energy.
  - **ASIA-PACIFIC:** Multilateral cooperation, spatial governance, and innovative technology applied to maritime sectors like tourism and fisheries.
  - **EUROPE:** Gaps in legal frameworks, data collection, and low public awareness about the potential of the blue economy.
  - **LATIN AMERICA AND THE CARIBBEAN:** Diagnostics to identify priority economic activities, cross-border initiatives, and financial inclusion in renewable energy and emerging technology projects.

1

Introduction

In recent years the Blue Economy has gained increasing salience as a driver of stable industrial employment, as a means to safeguard the environment and create shared prosperity.

1.1 DEFINING THE BLUE ECONOMY

In recent years the Blue Economy has gained increasing salience as a driver of stable industrial employment, as a means to safeguard the environment and create shared prosperity. There is no universally accepted definition of the Blue Economy. The Blue Economy covers economic activities revolving around or specifically aimed at the sustainable direct or indirect use, management and conservation of "blue" resources, covering bodies and streams of water, including the world's ocean (and seas)[1], lakes, wetlands and rivers, coastal areas and islands, and further comprising animal and plant species habituating in or in direct proximity to these waters. Furthermore, the concept includes derived uses, such as for hydro energy and carbon storage, and acknowledges "blue" resources' relevance for continued planetary existence, for instance, in terms of biodiversity conservation and cultural significance.

The key objectives of the Blue Economy can be broken down into two objectives:

1. ensuring the sustainable use of ocean and other water resources for economic growth and improved livelihoods, and
2. ensuring the environmental and ecological sustainability of the world's waters, particularly the ocean.

1) It is often thought that there are five separate oceans: the Atlantic, Pacific, Indian, Arctic, and Southern (Antarctic). However, in reality they are all connected by a continuous circulation of currents around the world, creating one single continuous body of water: the global ocean. See for example https://noc.ac.uk/about-us/support-us/one-ocean

The concept of Blue Economy comprises traditional maritime economic sectors as well as emerging sectors. Examples of the former include fisheries and aquaculture, traditional offshore extractive industries (oil and gas) and renewable energy, such as the established offshore wind industry, but also the tourism sector, marine, river and lake transport and trade infrastructure, and shipbuilding. Emerging sectors include ocean engineering, ocean energy generation and management, industrial desalination, seabed mining, marine biotechnology and synthetic (marine) biology, and waste and pollution management.

BLUE ECONOMY DEFINITIONS

Many international organizations have elaborated their own definitions of the Blue Economy. The United Nations Department of Economic and Social Affairs (2014) has offered **a general definition of the "Blue Economy"** as "*the sustainable ocean-based economy, which comprises a range of economic sectors and related policies that aims to foster economic and social progress while maintaining the health of our oceans and coasts*". More recently, the World Bank (2017) defined the "*Blue Economy" as "the sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of ocean ecosystems*".

1.2 THE BLUE ECONOMY AND THE SDGs

Goal 14 of the 2030 Agenda for Sustainable Development aims to "conserve and sustainably use the oceans, seas and marine resources for sustainable development".[2] While aquatic ecosystems fit neatly into SDG14, they also play a vital role in achieving all 17 Goals.[3] If the ocean were a country, it would be the world's seventh-largest economy, providing goods and services worth at least US$2.5 trillion per year.[4] The ocean's natural capital is valued at over US$24 trillion, underscoring its crucial role in economic development. The ocean makes major contributions to global sustainable development. Best industrial practices in the Blue Economy—aligned with SDG9 (industry, innovation, and infrastructure)—are essential for sustainable growth, driving economic development and environmental stewardship.

The Blue Economy is a source of high-quality jobs in areas such as fishing and aquaculture, energy, tourism, conservation, research and science, communications, engineering, and law, thereby contributing to SDG1 (no poverty) and SDG 8 (decent work and economic growth). Fisheries and aquaculture alone provide at least 260 million jobs to the global economy.[5] Furthermore, it contributes to SDG2 (zero hunger) by providing nutritious "blue foods" as a primary source of protein for around 3 billion people.[6] And sustainable nutrition from the ocean could supply over six times more food than it does today, representing more than two-thirds of the edible meat that the FAO estimates will be needed to feed the future global population, according to the High Level Panel for a Sustainable Ocean Economy.[7] The ocean contributes significantly to SDG-13 and the Paris Climate Agreement as it is the biggest carbon sink of the world, absorbing 25% of all carbon dioxide emissions, capturing 93% of the excess heat produced by these and generating half of the planet's oxygen. Leveraging the full potential of the Blue Economy is thus a pre-requisite for achieving sustainable development globally.

2) https://www.globalgoals.org/goals/14-life-below-water/
3) https://impact.economist.com/ocean/ocean-sustainable-development-goals
4) https://updates.panda.org/10-numbers-that-will-make-you-look-at-the-ocean-differently
5) https://www.un.org/en/desa/exploring-potential-blue-economy
6) https://sdgs.un.org/news/sustainable-blue-foods-are-vital-global-food-security-33148
7) https://oceanpanel.org/wp-content/uploads/2022/05/The-Future-of-Food-from-the-Sea.pdf

1.3 THE BLUE ECONOMY ECOSYSTEM

There is a multitude of complementary institutions in the Blue Economy space. Each has a unique contribution to make based on its specific mandate. As far as UNIDO is concerned, its mandate is reflected in SDG9: "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation" , although UNIDO's activities contribute to all the SDGs. The Organization has the expertise and experience in sustainable industrial development to play a pivotal role and have a unique contribution in the attainment of SDG9 through its interventions that promote the Blue Economy, specifically focusing on Blue Industry, i.e. industries that promote sustainable livelihoods, industrial value chains, and innovation. It can also contribute to the reclamation of marine lands and the preservation of ocean ecosystems through its experience in fostering innovation through proliferation of circular economy methods of production and enabling advanced digital production technologies, which reduce the toll on the blue environment. Integrated coastal zone management, which is a multi-disciplinary framework, aimed at balancing the economic, social and environmental imperatives of maritime ecosystems in a sustainable and participatory fashion, is also an essential framework for meeting the future needs of the maritime ecosystem.

Below is a non-exhaustive overview of key organizations in the Blue Economy ecosystem.

TABLE 1: Key organizations in the Blue Economy ecosystem

Ensure that people, planet and prosperity benefit from the development of a sustainable, inclusive and resilient Blue Industries through improved livelihoods, sustainable trade, food security, and healthy aquatic ecosystems.

Other UN organizations in the Blue Economy Ecosystem	UNDP	UNEP	WORLD BANK	UNESCO	UNCTAD	FAO	IMO	UN	UN GLOBAL COMPACT
Opportunities for collaboration	Integrate water resource-based livelihoods into national development plans and support community-based blue industry projects.	Support the integration of environmental safeguards into blue industry policies and practices.	Provide financial support for the development of infrastructure and capacity-building projects that catalyze blue industries in developing countries.	Stimulate ocean science and knowledge generation to catalyze new opportunities for sustainable development of blue industries.	Enhance trade and market access for blue products, focusing on reducing barriers for developing countries.	Promote sustainable aquaculture and fisheries practices that align with value-chain development in blue industries.	Advance global standard-setting for the safety, security and environmental performance of international shipping [9]	Scale up sustainable tourism models and mainstream linkages between tourism and other blue industries.	Join forces with UNIDO to engage private sector stakeholders in advancing sustainable blue industries.

8) https://www.globalgoals.org/goals/9-industry-innovation-and-infrastructure/

9) https://www.imo.org/en/About/Pages/Default.aspx

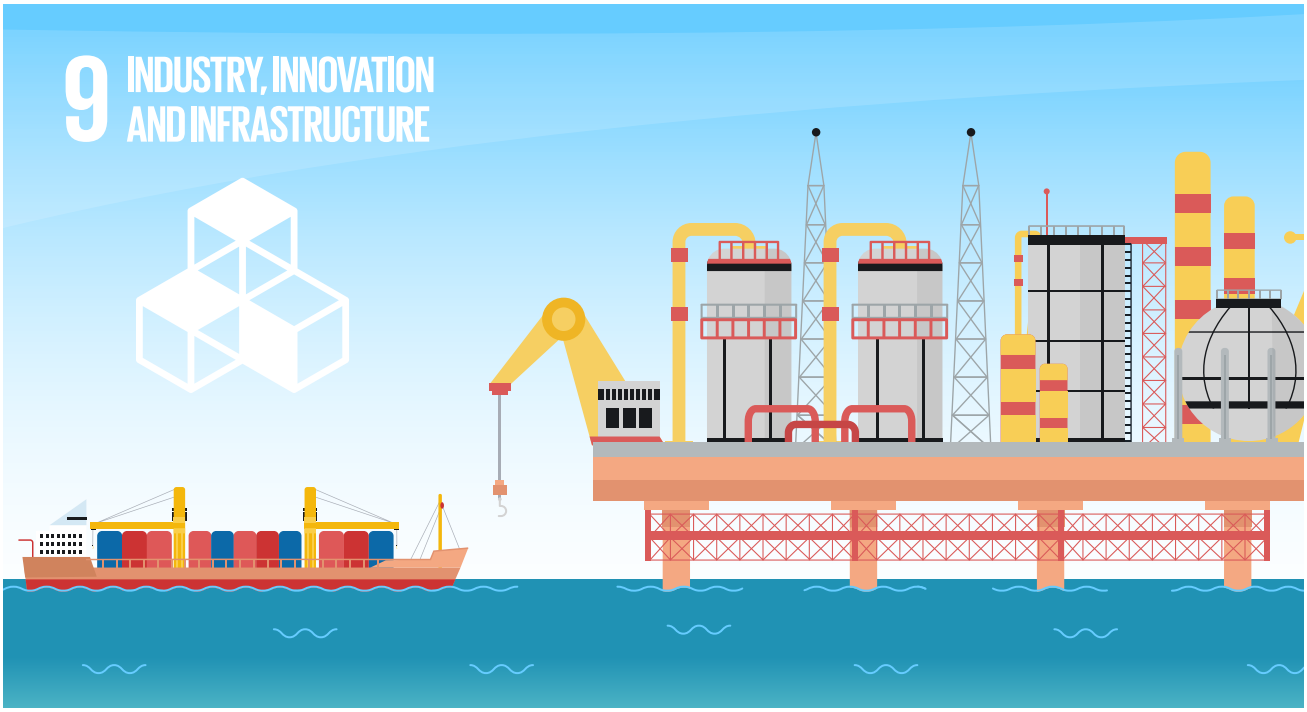
1.4 DEFINING THE SCOPE OF BLUE INDUSTRY WITHIN THE BLUE ECONOMY

UNIDO, as the custodian agency for six industry-related indicators under SDG9, is uniquely positioned to develop industries within the Blue Economy context. As such, UNIDO has recently coined the term Blue Industry to refer to "all traditional and emerging water-related productive activities, which contribute towards the enhancement of sustainable livelihoods, strengthening of industrial value chains, safeguarding of the environment and facilitating and scaling up of innovation, thus positively addressing people, planet and prosperity."[10]

This definition encompasses the ocean and inland water sources, such as rivers, lakes, mountains and oases. A large share of the Blue Economy's potential lies within blue industrial activities. Blue Industry sectors include (but are not limited to) fisheries and aquaculture, fish processing, ports, coastal tourism, and shipbuilding.

New areas of development include desalination, marine biotechnologies, ocean energy, and seabed mining.

It is essential to ensure that Blue Industry can significantly contribute to the sustainable use of water resources for economic growth, improved livelihoods, and job creation, while preserving and regenerating the health of aquatic ecosystems. This includes preventative, reactive and post-crisis rehabilitation measures, aligned with the Sendai Framework on Disaster Risk Reduction 2015-2030, for example through the development and diffusion of early warning systems, especially to Small Island Developing States and Least Developed Countries, and an end to environmentally-harmful practices which might exacerbate the risk of maritime disasters, such as earthquakes, hurricanes, tsunamis, flooding, oil spillages inter alia.



10) https://hub.unido.org/sites/default/files/publications/FINAL%20BLUE%20INDUSTRY.pdf

SUMMARY

Implications for UNIDO's Blue Industry Programmatic Framework

In recent years the Blue Economy has gained increasing salience as a driver of stable industrial employment, as a means to safeguard the environment and create shared prosperity. While the ocean fits neatly into SDG14, it also plays a vital role in achieving all 17 Goals.

A large share of the Blue Economy's potential lies within blue industrial activities. While there is no universally accepted definition of the Blue Economy, UNIDO has coined the term "Blue Industry" to reflect the critical contribution of water-related productive activities to the Blue Economy.

The Blue Economy's transition from a "brown Blue Economy" to a "sustainable Blue Economy" and, most recently, towards a "regenerative Blue Economy" means that Blue Industry will also increasingly focus on enshrining regenerative principles into industrial practices.

There is a multitude of complementary institutions in the Blue Economy space. UNIDO is the only specialized agency within the UN system mandated to promote inclusive and sustainable industrial development in Member States. There are opportunities for intensifying cooperation with other players in the ecosystem, for example with United Nations Environment Programme Finance Initiative (UNEP FI) and the World Bank on ocean finance, UNESCO and the World Ocean Initiative on knowledge generation, and with sectorally-focused organizations such as FAO on blue foods, UN Tourism on marine tourism, and IMO on shipping.

2

Global context and challenges

National strategies are critical to countries being able to advance livelihoods, create jobs, and stimulate economic development while also protecting and preserving important water resources.

2.1 BLUE POLICY AND REGULATORY LANDSCAPE

The **UN** has placed a renewed emphasis on the acceleration of actions that would enhance the Blue Economy and its continued sustainability, with significant implications for Blue Industry. Notably, the designation of the UN Decade for Ocean Science for Sustainable Development (2021-2030) provides opportunities for Blue Industry to benefit from increased investment into science and technology, and to reorient its production methods towards sustainability and resource efficient cleaner production (RECP). Blue Industry is also set to benefit from the establishment of the United Nations Common Oceans Programme, a global alliance of stakeholders and partners committed to transformational change, promoting sustainable use of marine resources, enhancing marine spatial planning and strengthened biodiversity conservation in the areas beyond national jurisdiction.[11]

The **High Level Panel for a Sustainable Ocean Economy (Ocean Panel)**, has been launched in 2018 and is supported by 19 world leaders, which represent 50% of the world's coastlines, 45% of global Exclusive Economic Zones, 21% of the world's fisheries, 23% of the world's shipping fleet. The Ocean Panel is supported by the UN Secretary-General's Special Envoy for the Ocean. Based on the shared understanding of the need to improve the state of the ocean, the countries in the Ocean Panel are committed to producing national sustainable ocean plans with the aim of sustainably managing 100% of the ocean area under national jurisdiction. In December 2020, the Ocean Panel put forward a new ocean action agenda underpinned by a commitment to sustainably manage 100% of national waters by 2025.

International treaties pertaining to Blue Industry include the UN Convention on the Law of the Sea (UNCLOS). UNCLOS governs the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction. This includes the internationally legally binding High Seas Treaty, adopted in 2023, which includes crucial provisions to sustainably manage fish stocks.[12] The High Seas Treaty provides a legal mechanism to set up Marine Protected Areas (MPAs) on the high seas. This will help recover under-pressure fish stocks. It will also constrain activities of distant-water fishing fleets.[13]

The **World Trade Organization (WTO) Agreement on Fisheries Subsidies (AFS)** is another binding international agreement affecting the fisheries industry. It prohibits harmful subsidies, including those that support illegal, unreported, and unregulated (IUU) fishing; fishing of overfished stocks; and fishing of unmanaged stocks on the high seas. However, the agreement does not yet cover all subsidies, such as aquaculture and inland fisheries.

In terms of **national and regional Blue Economy policy**, many developing countries in the Global South have adopted interlinked Blue and Green Economy policy concepts to harness opportunities and mitigate risks for Blue Industry in areas such as aquaculture, renewable energy and financing.

11) https://webtv.un.org/en/asset/k1n/k1nk7cktte

12) https://news.un.org/en/story/2023/06/1137857

13) https://www.business.hsbc.com/en-gb/insights/global-research/the-high-seas-treaty

14) https://www.wto.org/english/tratop_e/rulesneg_e/fish_e/fish_e.htm

15) FAO. SADC Regional Aquaculture Strategy and Action Plan (2016-2026). FAO. [online]. https://faolex.fao.org/docs/pdf/sad212466.pdf

Especially for economies such as SIDS (also called "'large ocean states"), the integration of the Green and Blue Economies is critical, highlighted for example by the Seychelles' launch of the world's first sovereign blue bond, Palau's National Marine Sanctuary (which is twice the size of Mexico), Belize's debt conversion for ocean conservation, and Barbados' green economy roadmap.[16]

Given the interdependence and international nature of water-based resources, **regional organizations** have been at the forefront of Blue Economy strategies. The **African Union** (AU), for example, has crafted a Blue Economy Strategy aimed at guiding African countries to leverage the Blue Economy as a major force for their transformation, by fostering economic development and enhancing competitiveness across the continent.[17] It focuses on Blue Industry, especially fisheries/ aquaculture, sustainable shipping/transportation, coastal and maritime tourism, sustainable energy, and innovative financing. **ASEAN**, the **EU**, and others, have also developed Blue Economy strategies that incorporate a focus on Blue Industry.

Blue Industries have also made their way into **national priority agendas**. Coastal countries, island states, and nations with vast inland water resources are all developing strategies and action plans to put the Blue Economy on the agenda. National strategies are critical to countries being able to advance livelihoods, create jobs, and stimulate economic development while also protecting and preserving important water resources.

16) https://www.un.org/ohrlls/sids-global-business-network-forum-2024/session1

17) https://www.au-ibar.org/sites/default/files/2024-07/1b.%20ABES%20Governance%20Framework_Layout_ENG.pdf

SNAPSHOT OF SELECTED REGIONAL BLUE ECONOMY STRATEGIES

The **AU's Africa Blue Economy Strategy**[18] recognizes the huge value that the Blue Economy can make to the continent, projecting an economic contribution of US$405 billion and 57 million jobs by 2030, and US$576 billion of value created and 78 million jobs (incl. in oil and gas) by 2063 (the target year for the continent's overarching development blueprint Agenda 2063). Key Blue Industry sectors emphasized in the strategy include ports and shipping, fisheries, mining, tourism, blue carbon and ecosystem services, and research and education.

The **ASEAN Blue Economy Framework** advances the ambition to develop an inclusive, equitable and sustainable Blue Economy in the 10 countries in Southeast Asia that are part of the Association of Southeast Asian Nations.[19] The Framework focused on maximizing the potential of aquaculture, fisheries, renewable energy production, transport, and tourism. It also stressed the opportunity to catalyze emerging sectors such as marine biotechnology, marine bioprospecting, and aquatic data analytics.

In 2021 the European Commission introduced a **new approach for a sustainable Blue Economy in the EU**.[20] The new approach aligns ocean-based activities with the goals of the European Green Deal. It promotes consistency among Blue Economy sectors such as aquaculture, fisheries, clean energy, maritime transport, green shipping, shipbuilding, and coastal tourism. The new approach also highlights the importance of research, skills, innovation, and cooperation among countries and maritime users. Previously, the EU had focused on economic growth through ocean-based sectors via its Blue Growth Strategy.[21]

18) https://www.au-ibar.org/sites/default/files/2020-10/sd_20200313_africa_blue_economy_strategy_en.pdf

19) https://asean.org/wp-content/uploads/2023/09/ASEAN-Blue-Economy-Framework.pdf

20) https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2021:240:FIN

21) https://www.europeanfiles.eu/wp-content/uploads/2017/06/The-European-Files-Blue-Growth-Strategy-June-2017-Issue-47.pdf

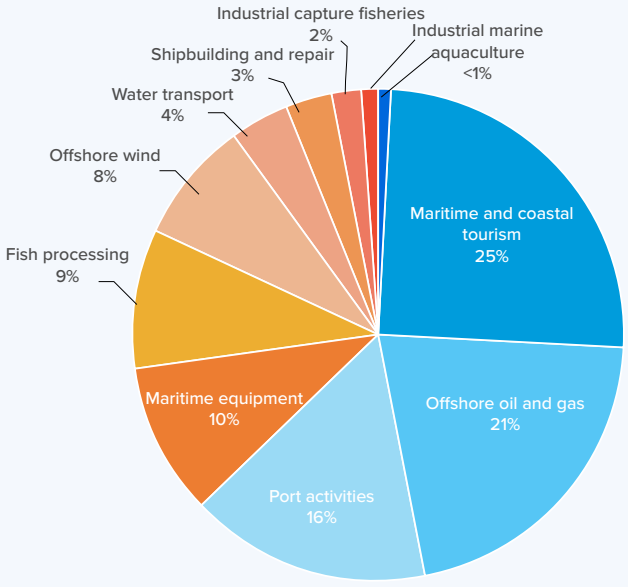
2.2 WATER-BASED ECONOMY AND PRODUCTIVE ACTIVITIES

Estimates of the size of the ocean and water-based economy vary. A comprehensive analysis based on the OECD's Ocean Economy Database in 2016 valued the ocean economy's output in 2010 at US$1.5 trillion in value added, or around 2.5% of world gross value added (GVA) at the time.[22] Offshore oil and gas accounted for about one-third of total value added of the ocean-based industries, followed by maritime and coastal tourism (26%), ports (13%) and maritime equipment (11%). The other industries accounted for shares of 5% or less. The data did not include artisanal capture fisheries (mainly in developing countries in Africa and Asia), which would have added further tens of billions of USD to the capture fisheries total.

More recent data, for 2021, that include water and freshwater ecosystems show that these ecosystems contribute US$58 trillion in economic value each year globally, which is equivalent to 60% of global GDP or to the combined GDPs of the US, China, Japan, Germany and India.[23]

The OECD also projected the size of the ocean economy and key sectors for a 2030 business-as-usual scenario (see Figure below). The projections showed that GVA in the ocean economy "business-as-usual scenario" is estimated to grow to more than USD 3 trillion (in constant 2010 USD) by 2030 and maintain its share of world total GVA at around 2.5%. Maritime and coastal tourism, including the cruise industry, is projected to take the largest share (26%), followed by offshore oil and gas exploration and production with 21% and port activities with 16%. The doubling of the ocean economy between 2010 and 2030 highlights the huge potential that the Blue economy has for sustainable economic growth in developing countries, in particular.

FIGURE 1: Value added of the ocean economy in 2030



Source: OECD[24]

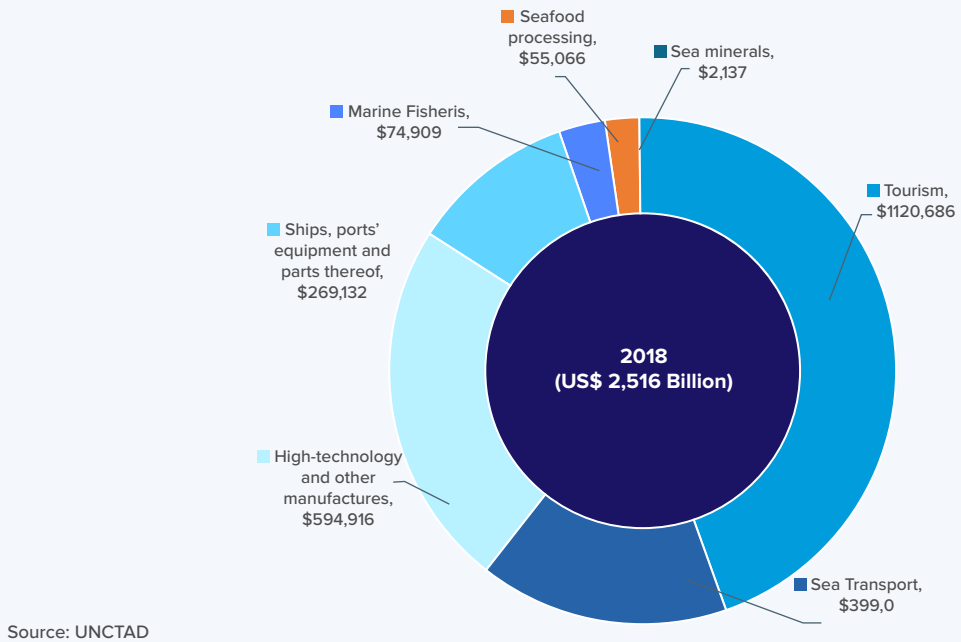
22) https://www.oecd.org/en/publications/the-ocean-economy-in-2030_9789264251724-en.html

23) https://www.wwf.eu/?11990891/WWF-Report-Water-crisis-threatens-over-11-trillion-in-economic-value-food-security-and-sustainability-in-Europe

24) OECD Statlink2 http://dx.doi.org/10.1787/888933334632

In 2018 UNCTAD estimated a total value for ocean-based goods and services at US$2.5 trillion, inclusive of the export value in ocean-based industries.[25] According to these data the biggest ocean-based industries in 2018 were coastal and marine tourism (US$1.1 trillion, 44% of the total), followed by marine high technology and other manufactures not classified elsewhere (US$595 billion, 24%) and maritime transport services (US$ 399 billion, 16%).[25]

FIGURE 2: Value of exports in ocean-based sectors



Source: UNCTAD

While the focus in this section has been on the ocean economy, the economic contribution of other water-based activities should not be neglected. For example, river economic belts (REBs) play a crucial role in the global supply chain as bonds of economic development. The 65 most significant REBs (each with a catchment area exceeding 100,000 km2) represent 45% of the world's land area, 63% runoff to ocean, 53% bio-capacity, 42% population, and 90%+ navigational capacity.[26] Rivers also serve as critical economic, social and environmental roles in supporting agriculture, transport, energy (especially hydropower), and tourism.[27] The world's ten most populous river basins are projected to account for almost a quarter of global GDP by 2050, up from around 10% in 2010.[28] Moreover, a significant share of global seafood is not produced in the ocean, but inland instead (e.g. in rivers, lakes and reservoirs): inland aquaculture accounts for around 44% of total aquaculture production.[29]

25) https://unctad.org/news/ocean-economy-offers-25-trillion-export-opportunity-unctad-report

26) https://www.nature.com/articles/s43247-023-01189-3

27) https://riversarelife.com/articles/the-economic-powerhouses-unlocking-the-value-of-rivers

28) https://www.theguardian.com/news/datablog/2012/jun/11/water-river-basins-economic-growth

29) https://openknowledge.fao.org/server/api/core/bitstreams/9df19f53-b931-4d04-acd3-58a71c6b1a5b/content/sofia/2022/aquaculture-production.html

2.3 ECONOMIC, SOCIAL AND ENVIRONMENTAL BARRIERS

Despite the huge potential of Blue Industries as well as well-intentioned political will from many governments around the world, the current development of Blue Industries has not been sustainable and inclusive in many countries and regions, notably the SIDS, the Least Developed Countries (LDCs) and Middle-Income Countries (MICs). Some key economic, social and environmental challenges to the development of Blue Industries are listed below.

2.3.1 Economic considerations

1

MARKET ACCESS AND TRADE BARRIERS

Unequal access to markets and trade barriers can disadvantage developing countries rich in marine resources. Small-scale, artisanal fisheries and traditional coastal industries may find it challenging to comply with regional and international market requirements and therefore may be uncompetitive in trading "blue products". For example, women are often excluded from markets.[30] A lack of cohesive policy frameworks can also hinder the adoption of innovative practices and limit the sector's overall growth. Thus, capacity-building and a conducive, enabling policy and business environments are crucial to ensuring economic benefits are equitably distributed.

2

INVESTMENT GAP

Developing and maintaining sustainable Blue Industries requires significant investments in research, technology, infrastructure, and workforce development. However, a recent analysis of Blue Economy finance found that Africa, Asia, the Pacific and Latin America receive only a fraction of investments: around 12% of the total.[31] A lack of funding—either directly into Blue Industries (such as fisheries or coastal tourism companies) or into supporting sectors (such as infrastructure)—as well as a lack of appropriate investment project preparation and appraisal capacities can limit the potential for growth in this sector. UNIDO's role in Blue Industry includes helping to unlock ocean finance in countries and regions with huge potential that are currently not receiving adequate resources to harness this potential.

30) https://oceanpanel.org/wp-content/uploads/2022/05/Towards-Ocean-Equity.pdf

31) https://www.eco-business.com/opinion/ocean-investments-must-reach-developing-countries/

3

ADEQUATE, RESILIENT AND LOW-CARBON INFRASTRUCTURE

The development of Blue Industries requires significant investment into supporting infrastructure. Many developing countries lack such infrastructure and are therefore, unable to take advantage of their abundance of blue resources through trade and the movement of goods to new markets. Moreover, climate adaptation and mitigation requirements increase infrastructure spending and put additional stress on tight fiscal households, particularly in coastal LDCs and SIDS. Both country groups are highly vulnerable to climate change and frequent storms and hurricanes increase spending for disaster response and recovery. For example, ocean energy requires significant knowledge transfer investment in infrastructure, which is a significant barrier in the developing world. UNIDO's Blue Industry approach puts a particular emphasis on creating an enabling environment for renewable energy investment and the strengthening of critical capacities for climate-resilient infrastructure planning.

4

ECONOMIC VULNERABILITY OF COASTAL COMMUNITIES AND SMEs

Coastal communities that are heavily reliant on the Blue Economy, particularly small-scale fishers, are vulnerable to declining fish stocks, climate change impacts, and competition from larger corporations. Economic diversification, integration with regional markets, social safety nets and cooperation among fishers and small businesses are needed to ensure the well-being of those working across Blue Industries. There are huge opportunities in harnessing the adaptive capacities of small-scale fishers. For example, small-scale fishers have been early adopters of technologies such as mobile phones, e-money and global positioning systems.[32]

32) https://www.frontiersin.org/journals/marine-science/articles/10.3389/fmars.2019.00171/full

2.3.2 Social implications

1

JOB CREATION, LIVELIHOOD SECURITY AND GENDER INCLUSION

Blue Industry offers the potential for job creation, contributing to poverty reduction and economic empowerment. However, ensuring equitable distribution of benefits and decent working conditions for all workers, including women and youth, is crucial. For example, value chains for blue products and services often hide inequitable opportunities and impacts on women.[33] Empowering local communities through participatory governance models, capacity-building, and equitable access to resources and benefits is crucial. Women play a significant role in many Blue Industry sectors, so addressing gender inequalities and ensuring women's participation in decision-making processes is essential for achieving social equity. UNIDO's role in spearheading a Blue Industry approach includes advocating for a value-chain approach to maritime sectors in order to address these challenges.

2

CAPACITY-BUILDING AND KNOWLEDGE-SHARING

Developing countries often lack the institutional and technical capacity and knowledge to fully harness the Blue Industry's potential. Strengthening human capacity and infrastructure will be critical components. Ensuring that developing countries can fully benefit from the UN Ocean Decade. Priorities include building oceanographic capacities, transferring marine technology and providing equitable access to ocean-focused education for underrepresented groups, including women.[34] Young people have also been a focus of capacity-building initiatives, for example in the SIDS.[35] Stronger international cooperation and knowledge-sharing initiatives are needed. UNIDO plays an important role in this endeavour.

Access to policymaking and transparency: While small-scale fishers make up the largest segment of economic actors impacting (and depending on) the blue environment, they are among the least represented, often lacking substantial access to policymakers and/or collective bargaining power, an effective role in policymaking fora and political instruments to enable the amplification of their experiences and knowledge. A key challenge in addressing this gap is the phenomenon of "blue fear"—a growing concern among Small Scale Fishing (SSF) communities that high-profit marine sectors such as oil and gas, industrial fishing, and large-scale tourism are monopolizing government investment and policy attention in the blue economy. Additionally, while international agreements such as the Kunming-Montreal Global Biodiversity Framework are widely welcomed, SSF representatives perceive that fisheries are often framed as a threat to biodiversity rather than as a crucial component of sustainable ocean management.

Informality: the informal nature of some blue sectors like SSF results in insufficient data to demonstrate their vital contributions to local food security, employment, and economic resilience. Despite the fact that approximately 492 million people depend, at least partially, on SSF for their livelihoods (FAO 2022)[36] and that most of the catch directly supports local food security, the sector is often seen as having poor prospects. Initiatives like the Fisheries Transparency Initiative (FiTI) can help address this issue and strengthen the role of SFF communities in shaping sustainable fisheries management.

33) https://oceanpanel.org/wp-content/uploads/2022/05/Towards-Ocean-Equity.pdf

34) https://www.sei.org/wp-content/uploads/2022/06/science-research-and-innovation-ecopy-compressed.pdf

35) https://www.itcilo.org/stories/importance-capacity-building-role-youth-blue-economy-african-sids

36) https://openknowledge.fao.org/server/api/core/bitstreams/df776156-23d4-4712-869e-8cf088ce5091/content#:~:text=492%20million%20people%20depend%20at,scale%20fisheries%20for%20their%20livelihoods.&text=Illuminating%20Hidden%20Harvests%20(IHH)%20is,)%2C%20Duke%20University%20and%20WorldFish

2.3.3 Environmental challenges

The so-called "triple planetary crisis" refers to the three interlinked challenges that humanity currently faces: climate change, pollution and nature loss.[37] The Blue Economy is both under pressure from the deepening planetary crisis (posing physical and transition risks to Blue Industry) and offers a wealth of potential solutions.

1

POLLUTION, WASTE MANAGEMENT AND OCEAN HEALTH

Pollution, waste management andaquatic ecosystems health: The marine and freshwater ecosystems face severe pollution, with nearly 80% of wastewater discharged untreated[38] and 19-23 million tons of plastic waste entering the aquatic ecosystems annually.[39] Non-point pollution sources such as fertilizer application and animal farming and other land-based pollutants, such as industrial wastewater discharge, further reduce and degrade water resources, impact aquatic life in rivers and lakes, and end up in the oceans. If not controlled, pollution and waste threaten the viability of Blue Industries, ecosystems and livelihoods Blue Industries can offer solutions to pollution, e.g. via marine litter removal, decontamination technology, circular, resource efficient and clean production (RECP) and irrigation technologies, optimized industrial water cycle and sustainable waste management. However, Blue Industry itself can also exacerbate ocean pollution. For example, more than 250 million tonnes of sewage and greywater are discharged into the ocean each year from shipping alone.[40] Meanwhile, discarded fishing gear accounts for an estimated 27% of beach litter in Europe and 46% of the floating debris in the Great Pacific Garbage Patch (a gyre of marine debris particles in the central North Pacific Ocean).[41]

2

CLIMATE CHANGE

Climate change impacts, such as rising sea temperatures, extreme weather events, ocean acidification, and changing fish distributions, challenge the livelihoods of coastal communities and biodiversity as well as key sectors such as fisheries, aquaculture, and blue tourism. These effects threaten livelihoods as around 680 million people live in low-lying coastal areas, almost 2 billion live in coastal megacities, 3.3 billion depend on fish for protein, and almost 60 million people work in fisheries and aquaculture. Integrating ocean health into the global climate action agenda has therefore increasingly become a priority at Conferences of the Parties (COPs) under the framework of the United Nations Framework Convention on Climate Change (UNFCCC). The Blue Industry can play a critical role in mitigating and adapting to climate change, e.g. providing alternative sources of livelihoods, supplying renewable energy and sustainable seafood. However, Blue Industries also threaten to exacerbate climate change if they do not transition to a net-zero world fast enough. The Ocean Panel has identified seven ready-to-implement and viable ocean-based climate solutions that can deliver up to 47% of the annual greenhouse gas (GHG) emissions reductions needed by 2050. These include the scaling of ocean-based renewables, the decarbonisation of ocean-based transport and coastal tourism, the phasing out of offshore oil and gas, the expansion of sustainable blue food production, restoring of coastal and marine eco-systems, as well as carbon removal and storage.

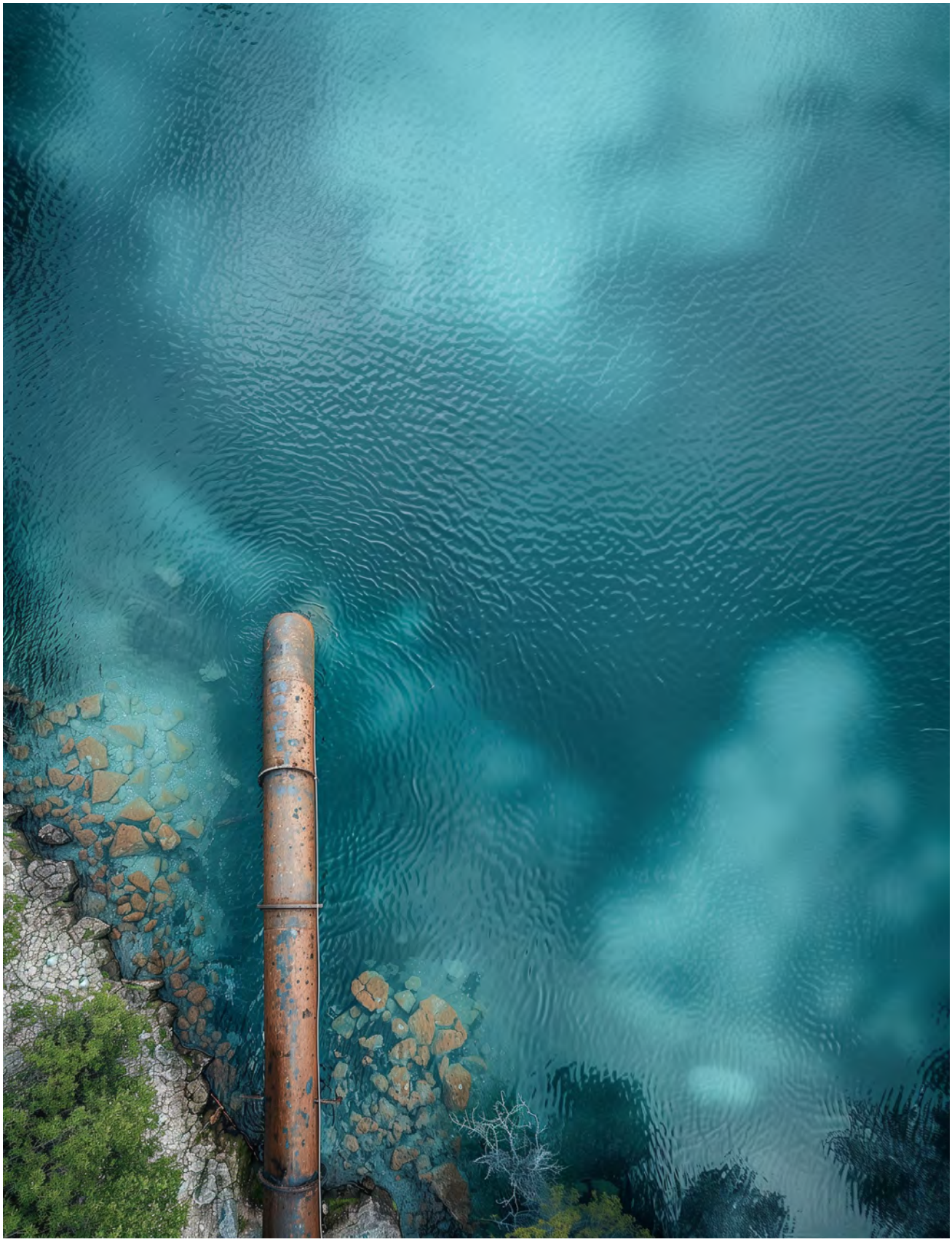
37) https://unfccc.int/news/what-is-the-triple-planetary-crisis

38) https://www.thegef.org/what-we-do/topics/international-waters/freshwater

39) https://www.unep.org/plastic-pollution

40) https://seas-at-risk.org/wp-content/uploads/2023/07/The-State-of-Shipping-and-Oceans-Report-Final.pdf

41) https://pacwasteplus.org/wp-content/uploads/2023/09/Fact-Sheet-Lost-and-Discarded-Fishing-Gear_v1_formatted.pdf



3

UNSUSTAINABLE PRACTICES AND HABITAT DESTRUCTION

Nature loss is also accelerating as a result of human-made climate change and resource exploitation. Unsustainable productive practices and habitat destruction, including overfishing, bottom trawling, and lack of traceability along supply chains, severely impact marine biosecurity and biodiversity. For example, bottom trawling is responsible for around a quarter of the global catch. However, 40-60% of the catch are unwanted and protected species, thus undermining biodiversity. The technique is also responsible for a huge share of GHG emissions because they harm blue carbon ecosystems such as seagrass.[42] Countries focusing on developing Blue Industries must therefore prioritize ensuring healthy aquatic ecosystems. Widespread coral bleaching and reef degradation have been observed and other critical marine ecosystems such as mangroves are also under threat. **Resource depletion** due to overexploitation of resources is another major threat to Blue Industry. For example, more than one-third of global fishery stocks are classified as "overfished" by FAO, up from 10% in the mid-1970s.[43]

Freshwater scarcity and stress affect approximately 80% of the world's population and 1.2 billion people live in river basins where human water use has surpassed sustainable limits.[44] Blue Industry approaches can mitigate the sectoral impact on critical water resources by transferring to less water- and energy-intensive environmental technology solutions, which improve water conservation using advanced tools such as soil moisture sensors, irrigation controllers, and real-time climate data collecting and analyzing tools.

42) https://www.clientearth.org/latest/news/what-is-bottom-trawling/

43) https://openknowledge.fao.org/server/api/core/bitstreams/9df19f53-b931-4d04-acd3-58a71c6b1a5b/content/sofia/2022/status-of-fishery-resources.html

44) https://www.thegef.org/what-we-do/topics/international-waters/freshwater

SUMMARY

Implications for UNIDO's Blue Industry Programmatic Framework

The UN has placed a renewed emphasis on the acceleration of actions that would enhance the Blue Economy and its continued sustainability, with significant implications for Blue Industry. For example, the designation of the UN Decade for Ocean Science for Sustainable Development (2021-2030) provides opportunities for Blue Industry to benefit from increased investment into science and technology.

International treaties and their implementation and interpretation influence the potential future trajectories of Blue Industries. For example, deep-seabed mining is unlikely to evolve into an acceptable blue industrial activity any time soon following a civil-society backlash against it. Meanwhile, fishing activities will be influenced by the High Seas Treaty and WTO Agreement on Fisheries Subsidies.

Many developing countries in the Global South have adopted interlinked Blue and Green Economy policy concepts to harness opportunities and mitigate risks for Blue Industry. Regional organizations have been at the forefront of Blue Economy and Blue Industry strategies, including the AU and ASEAN.

The doubling of the ocean economy between 2010 and 2030, and a similar rise for freshwater activities, highlights the huge potential that the Blue Economy has for sustainable economic growth in developing countries, in particular.

The Blue Economy is both under pressure from the deepening planetary crisis (posing physical and transition risks to Blue Industry) and offers a wealth of potential solutions by Blue Industry.

The current development of Blue Industries has not been sustainable and inclusive in many countries and regions, notably the SIDS, LDCs and MICs. UNIDO's expertise and experience in areas such as capacity-building, unlocking ocean finance, knowledge transfer, and value-chain approaches will be critical in overcoming these challenges.

3

Blue Industry

The blue economy is in transition, with traditional industries such as fisheries and aquaculture, established renewable energy (especially offshore wind), tourism, transport, and shipbuilding transforming because of global pressure to become more sustainable.

3.1 KEY SECTORS AND VALUE CHAINS

The blue economy is in transition, with traditional industries such as fisheries and aquaculture, established renewable energy (especially offshore wind), tourism, transport, and shipbuilding transforming because of global pressure to become more sustainable. As the ocean economy moves from an exploitative, extractive and unsustainable "brown Blue Economy" to a "sustainable Blue Economy" and increasingly a "regenerative Blue Economy", new Blue Industries and value chains are gaining in prominence. Emerging industries and value chains include ocean engineering, ocean energy generation and management, industrial desalination, marine biotechnology and synthetic (marine) biology, and waste and pollution management.

TABLE 2: Traditional and emerging industries of the Blue Economy (with examples)

Sector	Established industry / value chain	Emerging industry / value chain	Future trends
Energy	▪ Oil and gas* ▪ Hydropower ▪ Offshore wind (fixed and floating) ▪ Floating PV and other solar applications	▪ Tidal ▪ Wave ▪ SWAC ▪ Marine biofuels and bioenergy from algae	▪ OTEC ▪ Salinity Gradient
Blue food processing	▪ Fisheries	▪ Sustainable fisheries	
	▪ Aquaculture	▪ Open-ocean mariculture ▪ Finfish and shellfish aquaculture (marine and freshwater) ▪ Seaweed	▪ Regenerative aquaculture (e.g. 3D ocean farming) ▪ Smart and climate-resilient aquaculture
Tourism and recreation	▪ Beach and coastal resorts ▪ Cruises and recreational ▪ boating ▪ Marine and coastal-based sport tourism	▪ Ecotourism / nature-based tourism ▪ Cultural marine tourism ▪ Pescatourism (blending fishing and tourism experiences)	▪ Virtual and augmented reality experiences
Transport and trade	▪ Shipping ▪ Port infrastructure and services	▪ Sustainable shipbuilding ▪ High efficiency vessels ▪ E-logistics	▪ Artificial intelligence ▪ Alternative fuels, including green hydrogen
Cross-cutting sectors			
Marine biotechnology	▪ Seafood and feed (e.g. aquaculture applications) ▪ Energy (e.g. biofuels) ▪ Biomaterials	▪ Cosmetics and cosmeceuticals ▪ Nutraceuticals ▪ Bioremediation (e.g. oil spill removal, plastic degradation)	▪ Agronomy (e.g. biofertilizers) ▪ Deep-sea bioprospecting

* Oil and gas is not considered a part of the (sustainable) Blue Economy and is therefore not a focus area of UNIDO, but is a traditionally significant industry of the (brown) ocean economy.

BlueTech	▪ Ocean observation data (e.g. sensors, satellites etc) ▪ Drones	▪ Ocean data platforms	▪ Marine carbon dioxide removal (mCDR)
Blue finance	▪ Traditional equity and bond investments	▪ Impact investment ▪ Blue carbon credits	▪ Crowdfunding
Marine conservation	▪ Marine Protected Areas ▪ Marine environment decontamination activities ▪ Marine litter removal	▪ Marine regeneration, including through industrial circular economy practices	▪ Deep-sea ecological restoration

3.1.1 Energy

Hydropower currently generates more electricity than all other renewable technologies combined and will most probably remain the world's largest source of renewable electricity generation into the 2030s.[45] Renewable ocean energy has a high GHG emission reduction potential. It includes an array of technologies using marine space (e.g., offshore wind, floating PV) or non-living marine resources (e.g. wave and tidal energy, ocean thermal energy conversion, salinity gradients, seawater air conditioning, biofuels or bioenergy from algae). It also comprises non-ocean based renewable energy solutions serving traditional and emerging marine industries, such as fishery and aquaculture, desalination, biotechnology, deep sea mining, ocean intelligence, coastal tourism, shipping and ports. By co-location, ocean energy has the potential to become a multifunctional enabler for all kinds of marine and coastal industries, including the production of green and blue hydrogen.

Ocean energy technologies are at different stages of deployment and the technology ownership is unequally distributed. Whereas offshore wind (bottom fixed and floating) and solar PV applications are ready for industrial roll-out, other technologies are still at pre-commercial stage or at lower levels of technology readiness. However, due to ambitious deployment and support programs in the Global North, particularly Europe, US and Asia it is projected that most of these technologies will become commercial during the next decade.

45) https://www.iea.org/energy-system/renewables/hydroelectricity

FIGURE 3: Readiness of various ocean energy technologies (source: ADB)

Technology	Techno-Economic Status	Challenges	Benefits
Solar PV (for Marine / Offshore)	Mature Technology, Commercially Viable	Preferably deployed in calm waters; need proper planning for seaspace usage; address potential environmental concerns	Potential increased efficiency) due to cooling effect of water environment), co-application (e.g., food, water, transport, etc.)
Offshore Wind	Mature Technology, Available, Commercially Viable	Need for large marine area use an issue for large-scale farms	Leverage local marine and offshore capabilities (e.g., ship building, etc.)
Tidal Range (e.g., Barrage)	Mature Technology, Commercially Viable	Very high environmental impact for dam-like structures; Tide range >4 meters needed to be economically viable	Very predictable; technology similar to hydropower
Tidal Stream	Pre-Commercial, Turbine Technology High TRL	Technology costs need to be reduced	Very high predictability (18.6 years); resource not affected by weather; suitable for island regions
Ocean Current	Prototype and Pilot Systems	Limited sites; can be remote offshore	Can be baseload
Wave	Prototype and Pilot Systems	No technology convergence to scale (yet)	Niche applications; can be coupled to hybridize wind projects
OTEC	Prototype and Pilot Systems	Still very high LCOE (high CAPEX) even at 10 MW scale	Can be baseload supply
Salinity Gradient	Prototype and Pilot Systems	Still high LCOE. Needs co-application/integration (e.g., energy recovery in desalination plants) to make economic sense	Synergistic niche applications (aquaculture, salt production, desalination) and areas may be pathway to commercialization

CAPEX: capital expenditure, **LOCE:** levelized cost of energy, **MW:** megawatt, OTEX: ocean thermal energy conversion, **PV:** photovoltaic, **TRL:** technology readiness level.

Sources: International Renewable Energy Agency (IRENA), 2014 Ocean Energy: Technology Readiness, Patents, Deployment Status and Outlook, Abu Dhabi; IRENA 2020. Fostering a Blue Economy; Offshore Renewable Energy, Abu Dhabi; IRENA. 2020. Innovation Outlook; Ocean Energy Technologies, Abu Dhabi; and IRENA 2021. Offshore Renewables: An Action Agenda for Deployment. Abu Dhabi.

Offshore wind has shown great potential, accounting in 2022 for 7.1% of global wind power installation.[46] The Global Wind Energy Council expects offshore wind to provide up to 25% of total global power generation by 2050. Moreover, between 2020 and 2025 alone the industry could have added 3.3 million jobs to the global economy.[47]

Renewable ocean energy technologies offer an interesting opportunity for coastal developing countries in the Global South, including LDCs and SIDS in the mid-term. UNIDO has already started to support countries with knowledge transfer and through dedicated south-south and triangular cooperation programs such as the Global Ocean Energy Alliance (GLOEA) and the Global Network of Regional Sustainable Energy Centres (GN-SEC). However, so far these technologies are often not considered in the national energy and spatial blue economy planning. There are manifold barriers related to policy, regulation, standards, knowledge, capacity, technology access, finance, innovation and investment.

46) https://gwec.net/gwecs-global-offshore-wind-report-2023/

47) https://gwec.net/wp-content/uploads/2021/04/Jobs-Note-April-2021-2.pdf

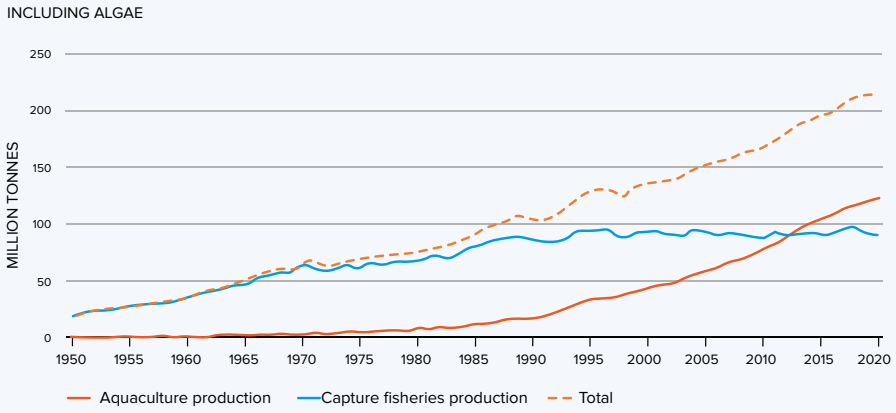
3.1.2 Fisheries and aquaculture / blue food

With more than one-third of global fishery stocks classified as "overfished" by FAO, the industry faces major challenges to regenerate fish stocks. Most of the damage to ecosystems has historically been done by unsustainable extractive practices by industrial fishing fleets, such as bottom trawling and excessive bycatch. Governments have fueled these unsustainable practices through subsidies, which have gradually been addressed for example via the WTO's AFS. But 96% of fishers around the world are artisanal or small-scale, accounting for around 35% of the fish caught worldwide (around 90% of the catch for SIDS).[48] Hence, small-scale fishers in developing countries are at the frontline of the overfishing crisis that has been caused by more industrialized nations, which can also lead to the destruction of oceanic ecosystems.

One way the industry is transitioning from exploitative to sustainable is via certification, notably by the Marine Stewardship Council. There is also a need to embed human rights and labor standards more into sustainable fisheries supply chains, assessment and certification.[49]

Aquaculture has enormous potential to feed the world in a more sustainable way than wild-capture fisheries and land-based food production. The industry has outpaced capture fisheries in the past decade and has overtaken wild fisheries in terms of total production (see Figure 6). As this trend is likely to continue, aquaculture producers and policymakers need to accelerate a transition to just and regenerative production patterns, which take into account the long-term viability of species and natural ecosystems.

FIGURE 4: World capture fisheries and aquaculture production (including algae)



Source: FAO[50]

Despite its potential, traditional aquaculture is characterized by many of the exploitative practices that have haunted fisheries and agriculture, including a focus on productivity over sustainability. As it addresses these challenges, the aquaculture industry needs to transition to a regenerative aquaculture system[51], innovating, embracing new regulation, governance and business models such as offshore aquaculture or polyculture farming, and adopting best practices and increased transparency linked to certification.

In developing countries, support for the fisheries and aquaculture sector must also focus on value-addition, including through cold-chain, processing, and export support.

48) https://unctad.org/news/artisanal-fishers-are-frontline-overfishing-crisis

49) https://www.humanrightsatsea.org/news/opinion-msc-must-change-or-step-away-voluntary-standards-human-rights-protections-seafood

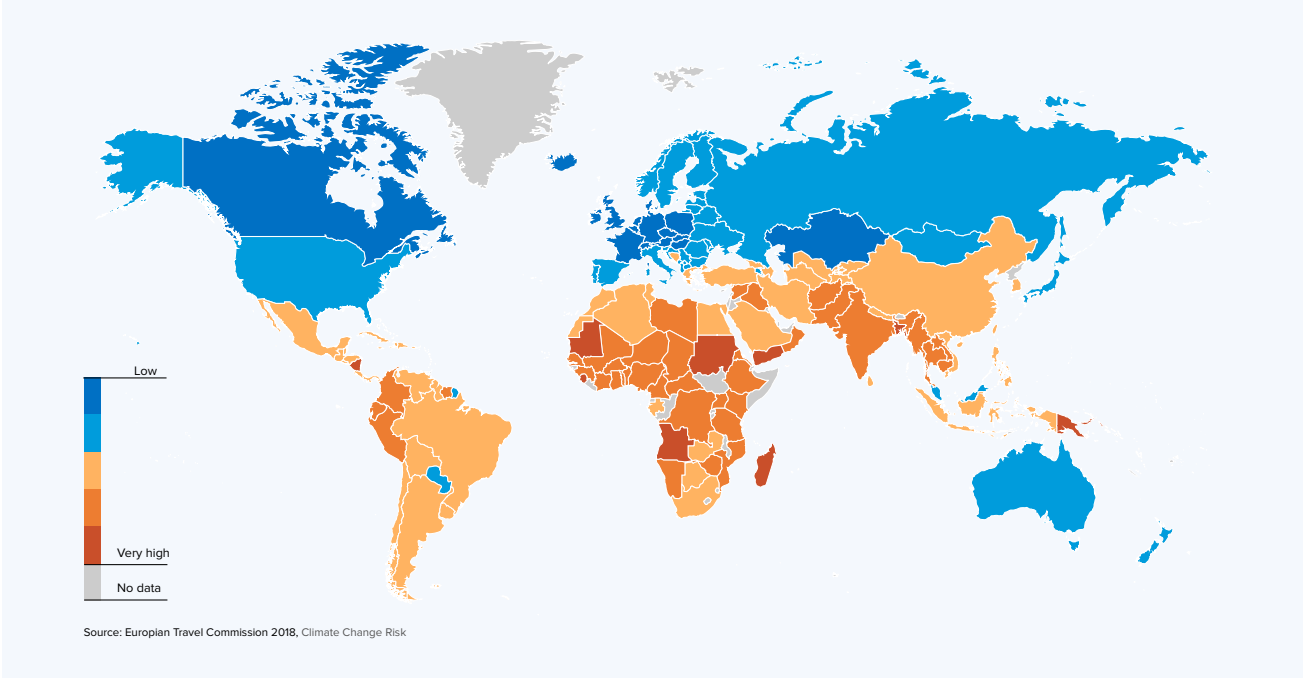
50) https://openknowledge.fao.org/server/api/core/bitstreams/9df19f53-b931-4d04-acd3-58a71c6b1a5b/content/sofia/2022/world-fisheries-aquaculture-production.html

51) https://www.martinkoehring.com/2023/11/08/diagnosing-the-aquaculture-system/

3.1.3 Tourism and recreation

The coastal and marine tourism sector is a key driver of industrial development within the blue economy. It encompasses a diverse range of industries, including the manufacturing of specialized machinery, equipment, and construction materials designed for coastal environments. Maritime and coastal tourism accounted for around a quarter of GVA of the total ocean economy in 2010, and the OECD expects this share to remain almost constant by 2030. This means tourism would actually be the relatively largest sector in the Blue Economy. It is a critical sector in many developing countries, especially the SIDS, where it accounts for almost 30% of GDP and 20-27% of employment.[52]

FIGURE 5: Global climate risk for tourism



Source: FAO[48]

Ensuring the sustainability of this sector requires infrastructure planning that accounts for seasonality and regional environmental conditions. The sector also maintains strong linkages with the manufacturing of vessels, water sports equipment, and beach-related products, fostering industrial diversification and strengthening supply chain integration.

52) https://www.aosis.org/tourism-the-lifeblood-of-sids-un-high-level-thematic-event-on-tourism/

TABLE 3: Industrial sectors linked to coastal and marine tourism

Industrial Sector	Description	Key Elements
Construction Materials	Sustainable materials for coastal infrastructure.	Inputs: Renewable materials. Standards: Coastal regulations.
Coastal Infrastructure	Sustainable buildings and facilities to diversify tourism and reduce seasonality.	Planning: Seasonal adaptation. Standards: Sustainability compliance.
Renewable Energy	Clean energy solutions for tourism and coastal logistics.	Tech: Solar, wind turbines. Consumables: Seasonal energy supply.
Coastal Agriculture	Native and seasonal food production for tourism.	Inputs: Organic fertilizers. Tech: Sustainable farming.
Fishing & Aquaculture	Sustainable seafood supply for tourism.	Equipment: Eco-friendly boats, nets. Resources: Seasonal seafood.
Manufacturing & Processing	Local resource transformation for food, water sports, and beach products.	Facilities: Seasonal processing plants. Standards: Tourism-linked certifications.
Biotechnology	Marine biotech for health, environment, and industry.	Tech: Specialized labs. Standards: Biotech sustainability.

Source: Proplayas Network

Coastal and marine tourism is a key driver of the blue economy, but its sustainability depends on scientifically grounded management52. Beach certification schemes establish environmental, safety, and management standards, ensuring that tourism infrastructure aligns with environmental regulations while fostering responsible visitor behavior53. Certified beaches not only attract more visitors but also generate substantial economic benefits.

Sustainable coastal and marine tourism also requires public policies and regulations that ensure responsible resource management. Industrial standards must integrate sustainability criteria for tourism infrastructure, equipment, and services, ensuring their harmony with natural and social environments. Training service providers is essential, emphasizing environmental management, customer service, and innovative technologies that minimize impact and enhance visitor experiences.

The recent pushback against ”overtourism” in recent years in some renowned tourist destinations draws attention to some of the potential downsides of unregulated or badly regulated tourism for the natural environment and the wider society, such as an accommodation crisis, erosion of natural environments, habitat destruction, pollution, water shortages and unsustainable GHG emission levels. In order to guard against these potential pitfalls, it will be necessary for policy makers to engage extensively with their citizens in civic fora, clearly signaling the likely effects of future policies and cooperating with local stakeholders to manage a sustainable flow of tourists, particularly during the high season, and to educate visitors on the precarity of local blue environments and culture.

3.1.4 Maritime transport and trade

Shipping is an indispensable industry, accounting for around 90% of world trade in goods. However, climate change and pollution have a major effect on the sector, first in terms of physical business risks but also in terms of transition risks, i.e. the need to comply with IMO standards and goals on net zero GHG emissions and pollution.

To get on a sustainable development trajectory by 2050, shipping needs to implement a series of significant changes, according to the IEA.[53] Reducing GHG emissions in the shipping industry requires immediate action on energy efficiency measures and a medium-term transition to renewable fuels like biofuels and electrofuels, supported by green hydrogen production. Achieving decarbonization will depend on strategic partnerships, enabling policies such as carbon levies, and investments in renewable energy, fuel infrastructure, and zero-carbon technologies.

Port infrastructure and services are projected to account for around 13% of the ocean economy in 2030, according to the OECD. Ports are critical for trade and economic development, as they help lower the cost of shipping and make supply chains more resilient.[54] Port infrastructure will be critical in supporting the decarbonization of shipping given the importance of the supply chain and logistics infrastructure. However, there is a lack of adequate port infrastructure in many developing coastal countries, limiting their ability to trade and for tourism to grow.[55]

Emerging industries in the transport and trade sector include sustainable shipbuilding and e-logistics. Sustainable shipbuilding addresses the construction, maintenance, and dismantling phases of the lifecycle with a reduced carbon footprint. Reducing GHG emissions and improving environmental sustainability are also among the drivers behind the digital transformation of maritime logistics.

53) https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2021/Oct/IRENA_Decarbonising_Shipping_2021.pdf

54) https://www.worldbank.org/en/topic/transport/brief/sustainable-development-in-shipping-and-ports

55) https://sustainableworldports.org/wp-content/uploads/2024-09-26-MTBS-IAPH-Port-Climate-Investments-Report.pdf

3.2 CROSS-CUTTING SECTORS AND EMERGING TRENDS

There are four key cross-cutting Blue Industry sectors that provide opportunities for sustainable industrial development in their own right, while also contributing to the four key sectors discussed in the previous section. These four sectors are marine biotechnology, BlueTech, blue finance, and marine conservation.

3.2.1 Marine biotechnology

Marine biotechnology refers to the field of science that deals with ocean exploration for development of bioresources and their applications. This can lead to new pharmaceutical drugs, chemical products, cosmetics, enzymes, seafood and feed, biofuels, biomaterials, and other products and processes.[56] In the seafood sector, for example, marine biotechnology can help to harness by-products or side streams that would otherwise lead to waste. Large amounts of fish biomass are discarded or wasted between landing and consumption, while fish and shellfish processing can also lead to loss of valuable compounds. Applications include extracted collagen for wound healing dressings, gelatin and chondroitin in cosmetics, and hydroxyapatite derived from fish bone used for feed in agriculture, for example.[57]

Similarly, marine biotechnology can be applied to seaweed too. For example, invasive seaweed can be harvested to turn these otherwise harmful species into functional food, nutraceuticals, cosmeceuticals and other applications. Seaweed also has applications in bioenergy, especially biodiesel. The advantage of seaweed use for biogas and bioethanol is that it would not compete with food crops for land or freshwater resources, thus providing a more sustainable biofuel source.[58] Similarly, bio-based polymers sourced from seaweed and crustacean shells are gaining prominence as alternatives to traditional plastics, reducing environmental impacts and supporting circular economy principles. Microalgae have also been used in degradation of pollutants of effluents from industries with toxic heavy metals.[59]

Marine ecosystems are also increasingly recognized as sources of sustainable raw materials for the construction industry, offering alternatives to traditional, high-carbon materials. For instance, bio-cement produced using marine microorganisms is emerging as a low-carbon alternative to conventional cement. Microbial life in the deep sea has been in the spotlight in recent years, with the top ten patent holders having filed marine gene patents referencing sequences from deep-sea life.[60] This is particularly pertinent in the context of the High Seas Treaty, adopted in 2023, which addresses the need to share the benefits from marine genetic resources in areas beyond national jurisdiction equitably.

56) https://www.isaaa.org/resources/publications/pocketk/52/default.asp

57) https://www.frontiersin.org/journals/marine-science/articles/10.3389/fmars.2021.629629/full

58) https://www.frontiersin.org/journals/marine-science/articles/10.3389/fmars.2021.629629/full

59) https://www.frontiersin.org/journals/marine-science/articles/10.3389/fmars.2021.629629/full

60) https://www.nature.com/articles/s41893-024-01392-w

3.2.2 BlueTech

Related to marine biotechnology, the BlueTech sector refers to the innovative use of emerging technologies to scale up the positive impact and manage risks associated with the Blue Economy.[61] Examples include earth observation through satellites or sensors to improve sustainable fisheries;[62] drones to help plant mangroves;[63] forecasting and early warning systems for extreme weather events, for example via AI, and robots to clean ocean pollution.[64] These technologies are contributing to what has been dubbed the "blue data revolution"[65] and provide the basis for the knowledge-based New Blue Economy.

BlueTech can also make a major contribution to marine carbon dioxide removal (mCDR). The ocean is already the world's largest carbon sink. The opportunity is that mCDR could help to enhance the ocean's carbon sink capacity, for example via artificial upwelling and downwelling, deep sea storage, electrochemical ocean carbon dioxide removal, macroalgae cultivation and carbon sequestration, blue carbon restoration and carbon sequestration, microalgae cultivation, and ocean alkalinity enhancement.[66] Ocean observations are critical in harnessing the potential of mCDR, e.g. via assessing the potential of each solution, identifying sites, and monitoring performance.[67] However, the future potential of mCDR depends on demand for blue carbon credits in the voluntary carbon offset market,[68] highlighting the importance of simultaneous maturing of blue finance solutions.

Accelerators and incubators offer critical support for BlueTech innovations at different stages of their development. Incubators provide resources for early-stage startups to transition from concept to prototype, offering technical mentoring, business development training, and access to research facilities. These mechanisms help startups pilot their technologies in real-world environments and overcome barriers to market entry, such as regulatory hurdles or limited access to capital.

In addition to direct support for startups, testbeds and policy sandboxes can further de-risk BlueTech innovations. Testbeds provide opportunities for startups to validate their technologies under operational conditions, ensuring readiness for large-scale deployment. Policy sandboxes enable governments to experiment with regulatory frameworks, refining them to support emerging technologies while ensuring alignment with sustainability goals.

61) https://wbwaterdata.org/blog/bluetech-innovative-technologies-applied-to-the-blue-economy

62) https://geoblueplanet.org/eo-for-tuna/

63) https://www.newscientist.com/video/2439751-drones-are-helping-plant-100-million-mangrove-trees-in-the-uae-by-2030/

64) https://theoceancleanup.com

65) https://www.martinkoehring.com/Asustainableoceaneconomyin2030.pdf

66) https://oceanvisions.org/ocean-based-carbon-dioxide-removal/

67) https://www.ofi.ca/programs/north-atlantic-carbon-observatory

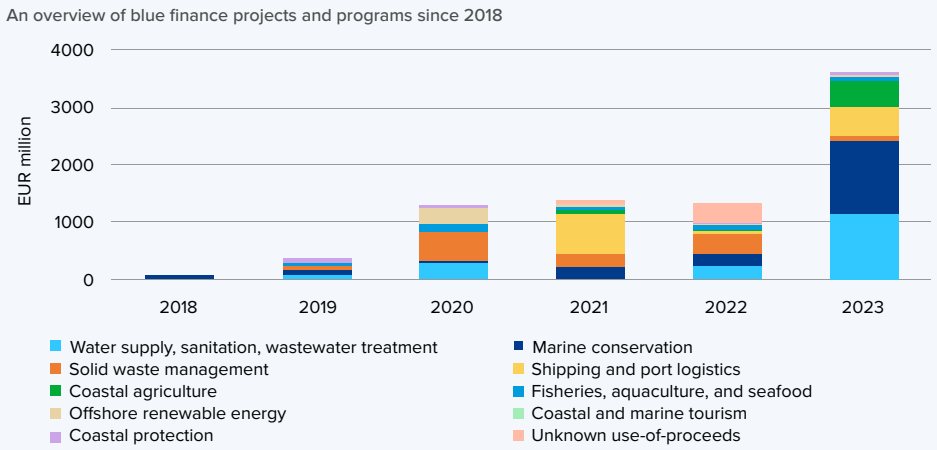
68) https://www.latitudemedia.com/news/what-running-tides-demise-means-for-carbon-removals-future

3.2.3 Blue finance

Blue finance has emerged as a growing segment within the broader green finance industry. It is one of the key enablers of Blue Industry. However, SDG14 remains the least funded of all the SDGs. According to WEF, some US$175bn per year is needed to achieve it by 2030, yet a total of just under US$10bn was invested between 2015 and 2019. This oft-quoted statistic, however, does not account for the fact that investing in the ocean relates to all SDGs given the ocean's importance to other SDGs such as climate action, energy, and industry.

Nonetheless, there are signs of progress. Although still limited in size, the blue bond market has seen significant growth since 2018 (see Figure 9). These bonds have often been issued in the context of debt-for-nature (or debt-for-climate) swaps, whereby a country's debt burden is reduced in exchange for environmental commitments. A prominent example of this is the Seychelles, where blue bonds, in addition to multilateral environmental funds, are being used to invest in marine coastal protection, fish replenishment reserves, and marine and climate adaptation, thus spurring blue investments at preferential interest rates, as opposed to mere external debt servicing, often at punitive market rates.[69]

FIGURE 6: The growth of the blue bond market 2018-2023



Source:
Bosmans, Enviromental Finance Data, RaboResearch 2023

Carbon credits are a critical financial product to attract private-sector finance. Carbon credits are generated by projects that avoid or remove GHG emissions. Companies buy these credits mostly on the voluntary carbon offset markets or the compliance markets. For the Blue Economy these credits can be in the form of regular carbon credits or, more specifically, for blue carbon credit, i.e. those generated by marine ecosystems that help to sequester carbon. Despite its potential for high-quality carbon credits, the blue carbon credit market is still small: as of January 2024, blue carbon projects accounted for only 0.2% of the total issuance, or just over 5 million credits.[70]

Different finance vehicles can be matched with each Blue Industry sector in terms of suitability. For example, sustainable aquaculture has been particularly attractive among impact investors, with several players in this space. Blue loans and blue bonds are also particularly suitable for aquaculture projects, while blended finance or grants are mostly used for blue carbon projects.

69) https://unfccc.int/sites/default/files/resource/1_TC_Lessons%20from%20the%20Seychelles.pdf

70) https://bezerocarbon.com/insights/how-the-vcm-can-turn-the-tide-for-blue-carbon

3.2.4 Marine conservation

Marine conservation is another cross-cutting sector. MPAs, which designate protected areas of the marine environment that are set aside by law to protect their natural and cultural resources, have a significant impact on other Blue Industry sectors. For example, they can increase fish stocks and catch volumes. Economic studies have shown that banning bottom-contact fishing gear from MPAs can have a net positive economic effect in the medium to long term by enhancing ecosystem services such as carbon storage, removal of pollutants, nutrient cycling and recreational opportunities.[71] Moreover, if well-managed, MPAs and sustainable aquaculture can co-exist and amplify each other's objectives.[72] MPAs can also boost tourism and recreation, while offering opportunities for marine science and education.

BlueTech, mentioned above, can support marine environment decontamination and marine litter removal activities. But these often deal with the symptoms that affect marine ecosystems. Approaches that address the root causes of pollution, climate impact and nature loss, notably the circular economy and the so-called Source-to-Sea Management, are geared to address the complex stakeholders and value chains involved in pollution.[73]

The deep sea—Earth's largest ecosystem—is the new frontier for ecological restoration.[74] Restoration efforts will require a deeper understanding of biodiversity and functioning of deep-sea ecosystems. Efforts such as the UN Ocean Decade provide a promising basis for this latest frontier for marine restoration. Cooperation between governments, industry (including technology providers), finance, and scientists will be needed to avoid harmful exploitation of the deep sea via deep-sea mining or bottom-contact fisheries.

Deep-sea mining involves the extraction of minerals via robotic vehicles from the seabed, primarily cobalt, nickel, copper and manganese, inter alia. This could potentially address the projected surge in demand for lithium, in particular, used for electric vehicle batteries. However, while the projected economic value of this untapped market could prove a boon for developing countries in particular, it has to be assessed against the potential for decay, necessitating greater research into the likely effects of deep-sea mining. Rigorous environmental and operational standards, aligned with international best practices, will be essential to ensure that any future mining activities are conducted responsibly, with robust monitoring, impact assessments, and mitigation measures.

A better understanding of the deep sea could help with highlighting its value to ecological processes and, by extension, the foundations of our economies and societies. There may be particular benefit to greater deep sea research with regard to biomimicry and nature-based technologies, which seek to emulate natural processes and designs within industry. For instance, coral skeletons have inspired concrete with a lower GHG footprint; dolphin sound frequencies are being investigated to improve underwater communication and provide early warning systems for tsunamis; and ocean micro-organisms are being researched with regard to their potential for new materials which could prove more biodegradable than plastics.[75]

71) https://www.mcsuk.org/news/our-new-study-shows-ocean-protections-worth/

72) https://thefishsite.com/articles/can-aquaculture-co-exist-with-mpas-zanzibar-indonesia-tunisia

73) https://siwi.org/source-to-sea-platform

74) https://www.sciencedirect.com/science/article/abs/pii/S0308597X18309199

75) https://biomimicry.medium.com/6-innovations-shaped-by-the-most-powerful-force-on-earth-8418eeaa59e3

3.3 PRINCIPLES AND OPPORTUNITIES

In order for Blue Industry traditional and emerging sectors to make a significant contribution to the SDGs, it is essential to ensure that they promote the sustainable use of water resources for economic growth, improved livelihoods, and job creation, while regenerating the health of aquatic ecosystems. This is clearly expressed in the majority of the Targets associated with Goal 14, "Life below Water", adopted by United Nations Member States at the Sustainable Development Summit in September 2015.

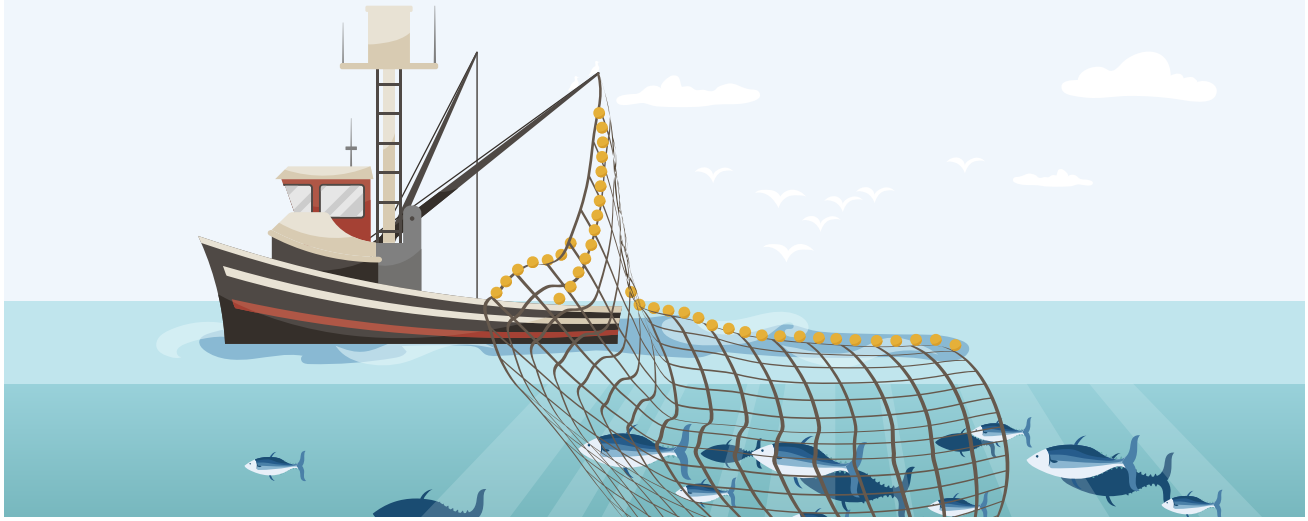
Blue Industry can thus have a positive impact on the achievement of sustainable development in at least four ways:

1

CHARTING A COURSE FOR SUSTAINABLE LIVELIHOODS AND SHARED PROSPERITY

Blue Industry possesses a great capacity to reduce poverty, generate high-quality employment, and advance economic growth. For example, fisheries and aquaculture alone contribute almost US$200 billion to the global economy per year, while more than 600 million people worldwide depend on the blue foods sector for food security and their livelihoods.[76] By harnessing the unique opportunities embedded in ocean, coastal and inland water systems, Blue Industry can contribute to important advancements in sectors such as healthcare, energy, tourism, and the circular economy.

Blue Industry offers many exciting possibilities for shared prosperity, job creation, and well-being through innovation, from developing novel pharmaceuticals and biomaterials to employing microbes for carbon capture. Blue Industry can make a major contribution to a just and regenerative future by implementing sustainable practices and promoting the adoption of responsible techniques and technologies. For example, in aquaculture, this could include promoting good farming practices such as sustainable use of fish feed, water quality monitoring and preventing fish disease, and working with workers and communities on new stewardship governance models. By regenerating marine biodiversity and the health of the ocean while promoting just working practices, Blue Industry can support the livelihoods and economic security of those living and working in blue sectors.



76) https://digitallibrary.in.one.un.org/TempPdfFiles/28661_1.pdf

2 REGENERATING AQUATIC ECOSYSTEMS AND COMBATING CLIMATE CHANGE

Blue Industry holds huge potential in combating the three planetary crises. Fundamentally, Blue Industry recognizes the intricate link between economic prosperity and a healthy aquatic environment. As such, it actively promotes practices that protect and regenerate aquatic ecosystems. For example, by implementing responsible fishing practices, minimizing bycatch through innovative gear designs, decarbonization and use of green energy in fishing, and introducing circular approaches (for example circular fish feed)[77], Blue Industry fosters a collaborative approach towards safeguarding the environment.

Additionally, promoting responsible waste management practices within Blue Industry, such as optimizing the economic value of byproducts and waste, minimizing plastic and chemical pollution[78] as well as implementing effective wastewater treatment systems, further protects aquatic ecosystems and their biodiversity. Blue Industry can thus play a crucial role in promoting responsible consumption and production patterns (SDG 12). Meanwhile, the transition towards a low-carbon future necessitates the exploration of affordable and clean renewable energy sources (SDG 7). Ocean-based energy from wind, waves, tides, and currents can all be harnessed to generate clean energy, contributing significantly to reducing greenhouse-gas (GHG) emissions and mitigating climate change. Advancements in offshore wind farm technology are making this a more cost-effective and efficient option.[79]

3 NOURISHING THE WORLD RESPONSIBLY

Blue food (aquatic food) could be one way to achieve just and regenerative food systems. It has many potential benefits compared with land-based production, such as contributing to healthy diets (especially essential vitamins, minerals, omega-3 fatty acids and other nutrients not found in plant-based or other animal-based proteins), improving production patterns, reducing reliance on soils and freshwater, restoring biodiversity and reducing pollution. The fisheries and aquaculture sectors make an important contribution to global food security and nutrition (SDG 2). Blue foods contribute around 17% of the animal proteins consumed in 2019, reaching 23% in lower-middle-income countries and more than 50% in parts of Asia and Africa.[80] However, more than a third of global fishery stocks are classified as "overfished" by FAO, up from 10% in the mid-1970s.[81] With traditional fisheries facing challenges of overfishing and environmental degradation, aquaculture offers a promising alternative for meeting the growing global demand for seafood. According to the Ocean Panel, if uptake continues to accelerate and if the industry adopts alternative marine feed innovations, the ocean could provide over six times more food than it does today—more than two-thirds of the animal protein needed to feed the future global population in 2050.[82] Aquaculture has grown faster than capture fisheries in the past decade and has overtaken wild fisheries in terms of total production. This trend is likely to continue which makes it even more urgent for aquaculture producers and policymakers to support a transition to just and regenerative production patterns.

77) https://effop.org/news-events/aquaculture-advisory-council-presents-circular-fish-feed-recommendation-to-the-european-commission

78) https://backtoblueinitiative.com/

79) https://pcmp.springeropen.com/articles/10.1186/s41601-022-00239-w

80) https://openknowledge.fao.org/server/api/core/bitstreams/9df19f53-b931-4d04-acd3-58a71c6b1a5b/content/sofia/2022/consumption-of-aquatic-foods.html

81) https://openknowledge.fao.org/server/api/core/bitstreams/9df19f53-b931-4d04-acd3-58a71c6b1a5b/content/sofia/2022/status-of-fishery-resources.html

82) https://oceanpanel.org/wp-content/uploads/2022/05/Summary_The-Future-of-Food-from-the-Sea.pdf

4

HARNESSING INNOVATION AND BLUE TECHNOLOGIES

There is also a significant blue dimension to the Fourth Industrial Revolution. Industry 4.0 technologies help to make better and more sustainable use of ocean resources, including ocean energy. Artificial intelligence, the Internet of things (IoT), cyber-physical systems, robotics, big data and new visualization models improve knowledge and understanding of marine ecosystems and enhance ocean industry performance and management. A rapidly proliferating range of advanced sensors is producing a flood of new data, providing powerful new tools for governments and communities to manage ocean resources. New technologies can help governments better manage their fisheries. Ocean-going drones can cruise the ocean for a year, offering a cost-effective solution for assessing fish stocks and patrolling remote areas. New technology creates new possibilities for small-scale fisheries as well. For example, smartphone apps can deliver information on weather, fish stocks, and market prices. Harnessing these new technological innovations and applications provides significant opportunities for Blue Industry to help create a knowledge-based New Blue Economy.

Overall, the global emphasis on the Blue Economy, including through the development of Blue Industries, reflects a growing recognition of the importance of ocean, coastal, and inland water systems to humanity's future. Through international collaboration, innovation, and sustainable industrial practices, there is an opportunity to harness their potential in a way that benefits all, while ensuring their health and productivity for generations to come.

SUMMARY

Implications for UNIDO's Blue Industry Programmatic Framework

Blue Industry includes four key sectors (energy, blue food, tourism and recreation, and transport and trade) and four cross-cutting sectors (marine biotechnology, BlueTech, blue finance, and marine conservation).

Several industries are emerging as challengers to established industries, including for example tidal and wave energy, fish, shellfish and seaweed, nature-based tourism, sustainable shipbuilding, ocean data platforms, and impact investment. Blue Industry also needs to be aware of future trends such as floating wind/solar, regenerative aquaculture, and marine carbon dioxide removal.

Blue Industry can have a positive impact on sustainable development in at least four ways: 1) Charting a course for sustainable livelihoods and shared prosperity; 2) Regenerating aquatic ecosystems and combating climate change; 3) Nourishing the world responsibly; and 4) Harnessing innovation and blue technologies.

4

UNIDO's Framework for advancing Blue Industry

The UNIDO Blue Industry Programmatic Framework aims to promote the integration, optimization and scale-up of the impact of the Organization's interventions in the field of the Blue Economy.

4.1 ALIGNMENT WITH UNIDO'S PRIORITIES AND MANDATE

UNIDO is a critical organization within the wider Blue Economy ecosystem. The Organization's expertise is well-aligned with the challenges that need to be addressed to harness the full potential of the Blue Economy identified in the previous section.

FIGURE 7: UNIDO's three-fold mandate

UNIDO's mandate is three-fold:

1 **TO END HUNGER BY HELPING BUSINESSES**

Through supporting SMEs, entrepreneurs and businesses to process and trade blue foods (such as fish and aquaculture), UNIDO is able to support local communities to advance food and economic security.

2 **STOPPING CLIMATE BREAKDOWN BY USING RENEWABLE ENERGY AND ENERGY EFFICIENCY**

Through the deployment of innovative renewable ocean energy technologies and business models, UNIDO is contributing to increased productivity of traditional and emerging marine and coastal industries, food and water security, climate resilience and decarbonization.

3 **SUPPORTING SUSTAINABLE SUPPLY CHAINS SO THAT DEVELOPING COUNTRY PRODUCERS GET A FAIR DEAL AND SCARCE RESOURCES ARE PRESERVED**

Through supporting developing countries to sustainably source and process blue products, UNIDO is able to both assist countries to move up the supply chain, but also ensure countries are doing so in an inclusive way that does not negatively impact the environment or their scarce blue resources.

4.2 TOWARDS AN INCLUSIVE AND SUSTAINABLE BLUE INDUSTRY – A THEORY OF CHANGE

The UNIDO Blue Industry Programmatic Framework aims to promote the integration, optimization and scale-up of the impact of UNIDO's interventions in the field of the Blue Economy, supporting the development of inclusive and sustainable blue industries that effectively contribute to sustainable development and the 2030 Sustainable Development Agenda. The Theory of Change that underpins the programmatic framework is structured around key conditions, required contributions, anticipated outcomes, transformations and expected impact.

4.2.1 Key Conditions

The framework identifies several critical conditions, which refer to the essential prerequisites necessary to create an enabling environment for Blue Industry to thrive. These are grouped into four main categories, as depicted below.

Strong Governance & Policies

The Strong Governance & Policies key condition includes establishing a global consensus and framework to promote Blue Industry, facilitating policy coherence through benchmarking and improved industrial statistics, ensuring harmonized and effective national and regional Quality Infrastructure Systems (QIS), enhancing participatory decision-making and coordination mechanisms, fostering international cooperation and partnerships, including public–private partnerships, to support Blue Industry development, and building strong institutional capacities to sustain and scale Blue Industry initiatives. Monitoring and accounting systems of blue resources are essential to know whether there is an opportunity to harness or a need to protect the same.

Industry Competitiveness

The Industry Competitiveness key condition includes promoting environmentally and socially sustainable and competitive business models, improving industry access to essential knowledge and demand-driven innovation, enhancing the capacity of small and medium-sized enterprises (SMEs) to comply with and compete in various markets, making conformity assessment services and certification schemes affordable and accessible, and promoting circular economy practices, strategies for decarbonization, and the use of renewable energy.

Market Conditions & Pull

The Market Conditions & Pull key condition includes facilitating cross-sectoral linkages to enhance the BI ecosystem and maximize impact, promoting integration into regional and global value chains, providing access to critical market intelligence, advancing market access activities, offering incentives for the private sector to adopt good practices, generating conducive business environments, facilitating finance and impact investment opportunities, improving market transparency and raising consumer awareness, and developing necessary physical infrastructure.

Social Equality & Inclusion

The Social Equality & Inclusion key condition includes ensuring equitable access to water resources and related economic opportunities; promoting equal participation of women, youth and disadvantaged groups and strengthening links all along the industrial value chain in order to create the conditions to empower and engage local and coastal; and empowering and engaging local and coastal communities to equally participate in and benefit from Blue Industries.

4.2.2 Required Contributions

To achieve these key conditions, the framework outlines the essential contributions that UNIDO can provide by leveraging its functions, experience, and expertise:

- At the **macro level**, UNIDO will contribute to agenda-setting, convening developing countries and supporting their voice in global dialogue. The Organization will also broker multi-stakeholder partnerships, conduct policy analysis and benchmarking, provide policy advice and ensure coherence of national legislations. In addition, UNIDO will raise awareness and build the capacity of policymakers and facilitate standards setting and compliance.
- At the **meso level**, UNIDO will focus on capacity-building of institutions, providing an enabling environment with institutional advisory and support services for Blue Industry sectors, and establishing platforms for knowledge sharing and collaboration.
- At the **micro level,** UNIDO will deliver firm-level technical assistance, foster local innovation, facilitate technology transfer and the digital transformation of industry, provide training and capacity-building for SMEs, and promote investment and access to finance.

4.2.3 Anticipated outcomes

The framework anticipates several direct outcomes from these efforts, including enhanced productivity and local value addition in the Blue Industry value chains, strengthening of national and regional quality infrastructure, and the development of competitive SMEs in the Blue Industry sectors. Additionally, there will be improved circularity and climate change mitigation and adaptation practices within Blue Industry, as well as effective participation and benefit for women and youth in the opportunities afforded by the sector.

4.2.4 Transformations (Indirect Influence)

These efforts are expected to drive broader transformations. The global community will be engaged, and Blue Industry's contributions to sustainable development will be reflected in relevant strategies, whose implementation will result in improved jobs, livelihoods, and resilience of local and coastal communities. This engagement will also lead to healthier aquatic ecosystems and climate-compatible Blue Industry development, as well as enhanced trade integration of the Blue Economy, thereby contributing to global food security.

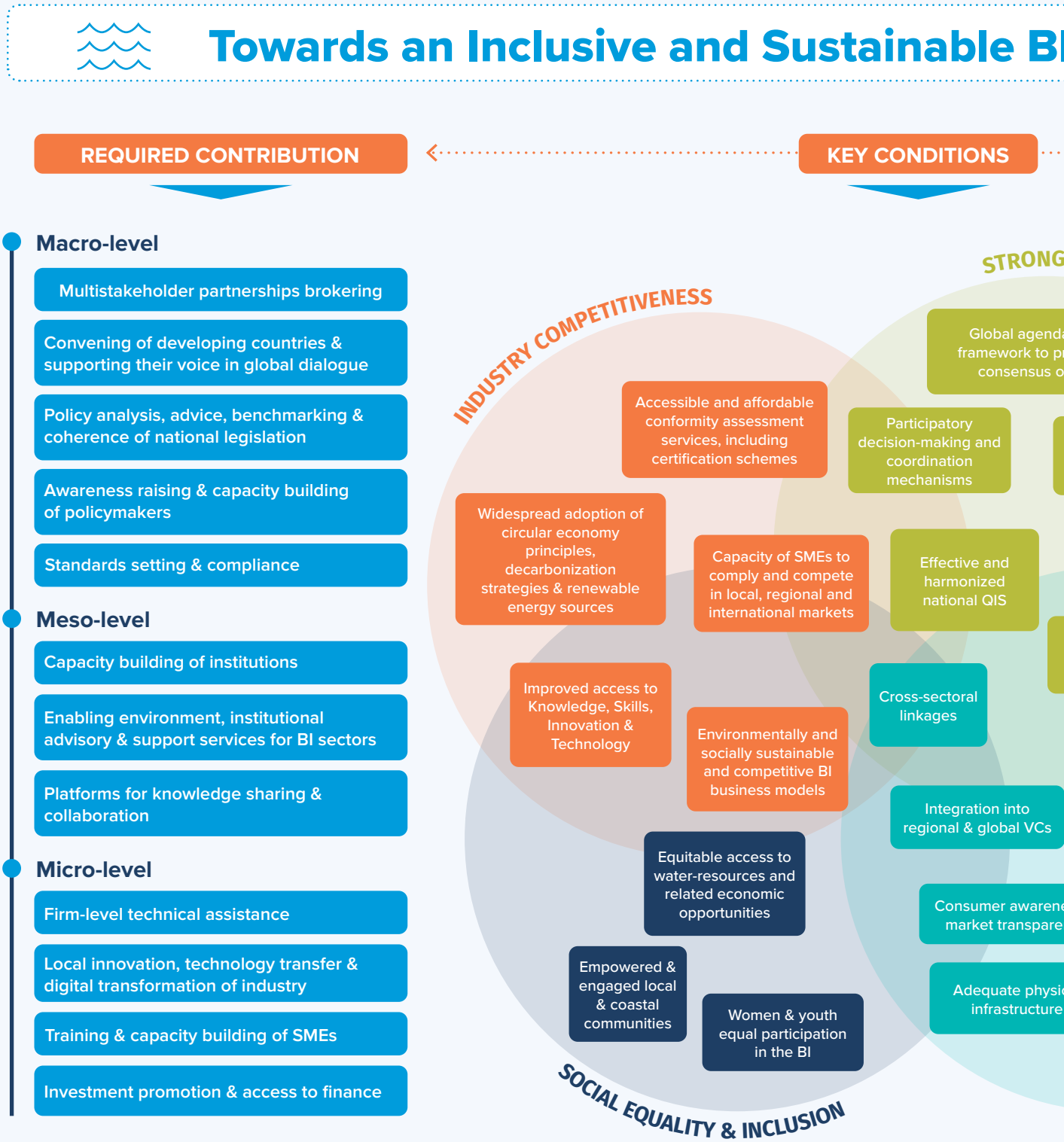
4.2.5 Expected Impact

The Blue Industry Programmatic Framework fosters a symbiotic relationship between people, the planet, and prosperity through the cultivation of a sustainable, inclusive, and resilient Blue Industry. At the heart of its impact lies the enhancement of human well-being, as communities dependent on the Blue Economy experience improved livelihoods, greater economic opportunities, and increased resilience to environmental and socio-economic challenges. By promoting sustainable practices and innovative solutions, the framework contributes to economic prosperity, fostering growth and innovation.

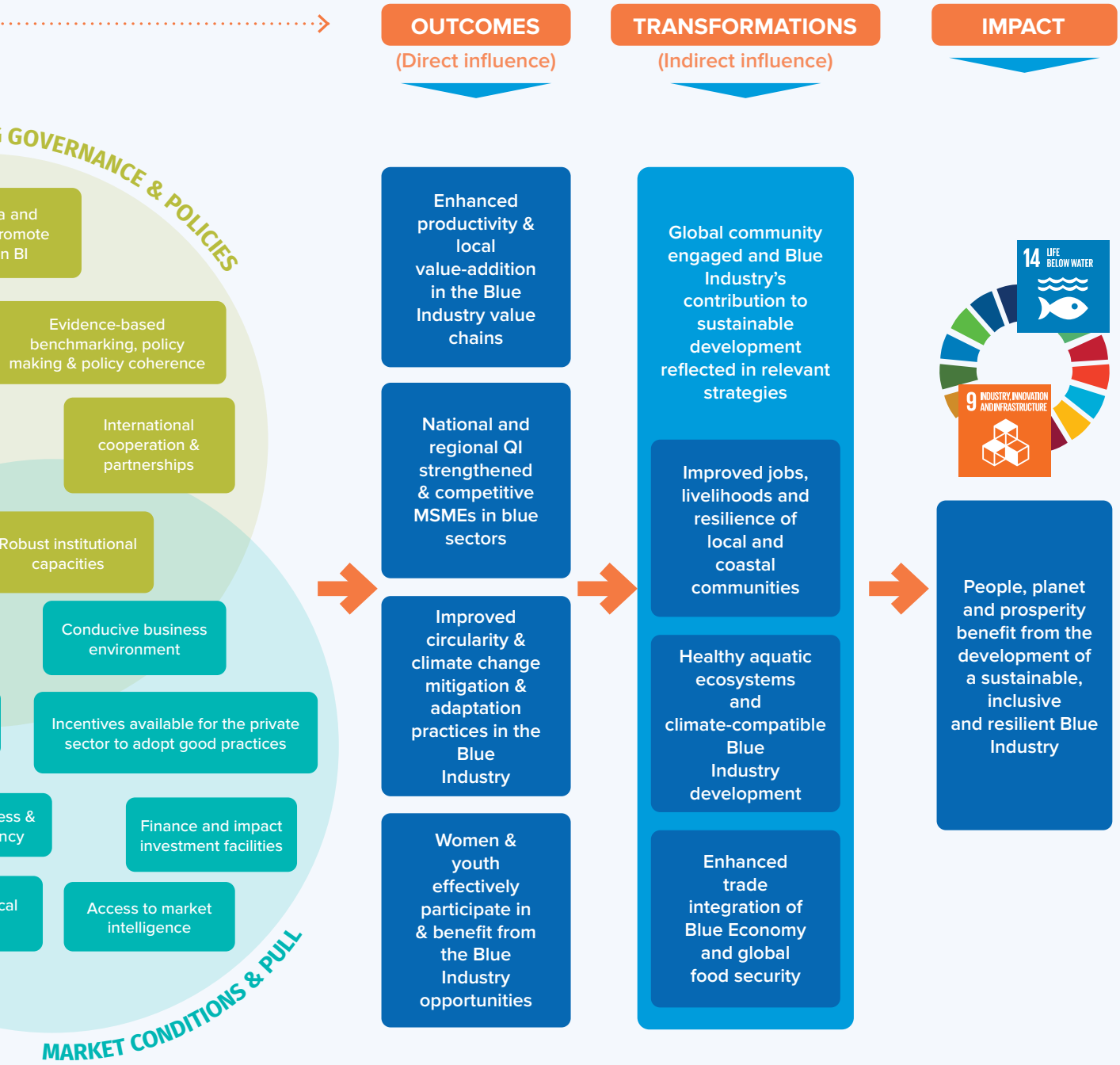
The framework will also champion the sustainable use of water resources and the preservation and restoration of marine and coastal ecosystems, ensuring their long-term health and vitality. Ultimately, this comprehensive approach generates positive ripple effects across society, economies, and ecosystems, driving progress towards a more sustainable and equitable future for all.

This Theory of Change encapsulates a comprehensive approach to developing Blue Industry, highlighting the interconnectedness of key domains of transformation in achieving long-term, impactful results.

FIGURE 8: Theory of Change: Towards an Inclusive and Sustainable Blue Industry



lue Industry: UNIDO's Theory of Change



4.3 WORKING PRINCIPLES

UNIDO promotes a holistic approach to development and is striving to increase its impact by combining interventions at the policy, institutional and enterprise levels. When operating in the field of Blue Industry, the Organization's interventions follow the principles below.

- **Ensuring Blue Industry makes a significant contribution to SDG9**, "Promote inclusive and sustainable industrialization" and all the other SDGs, harnessing the potential of Blue Industry to benefit people, planet and prosperity.
- **Partnerships at all levels (global, regional, national, local)** to create and lead on a global vision for Blue Industry development that can inform regional, national and local strategies, including for local communities.
- **Advocacy for a regional approach** wherever possible, in order to foster a spirit of exchange and collaboration. Blue Industry development has benefited from regional cooperation in the AU, ASEAN, Caribbean and other places.
- **Attaining international standards** as a guideline in production and environmental practice, for example in fisheries and aquaculture via certification and alliances.
- **Promoting advanced technologies and innovation** in order to make Blue Industry smarter, more efficient, more responsive to needs, and at the same time more sustainable and, increasingly, more regenerative.
- **Gender mainstreaming** and consideration of the specific opportunities and challenges of women, men and other genders.
- **Emphasis on social inclusion along value chains**, paying special attention to creating opportunities for women, young people, disadvantaged groups, and small-scale producers (including fishers) whenever possible.
- **Integrating climate resilience and environmental sustainability** into Blue Industry development by prioritizing (ocean) renewable energy sources, low-carbon technologies, resource efficiency and circular economy principles.

4.4 UNIDO'S STRENGTHS

UNIDO provides its support through four mandated functions: technical cooperation; action-oriented research and policy-advisory services; normative standards-related activities; and fostering partnerships for knowledge and technology transfer. Figure 12 shows UNIDO's strengths in each field with regard to Blue Industry development.

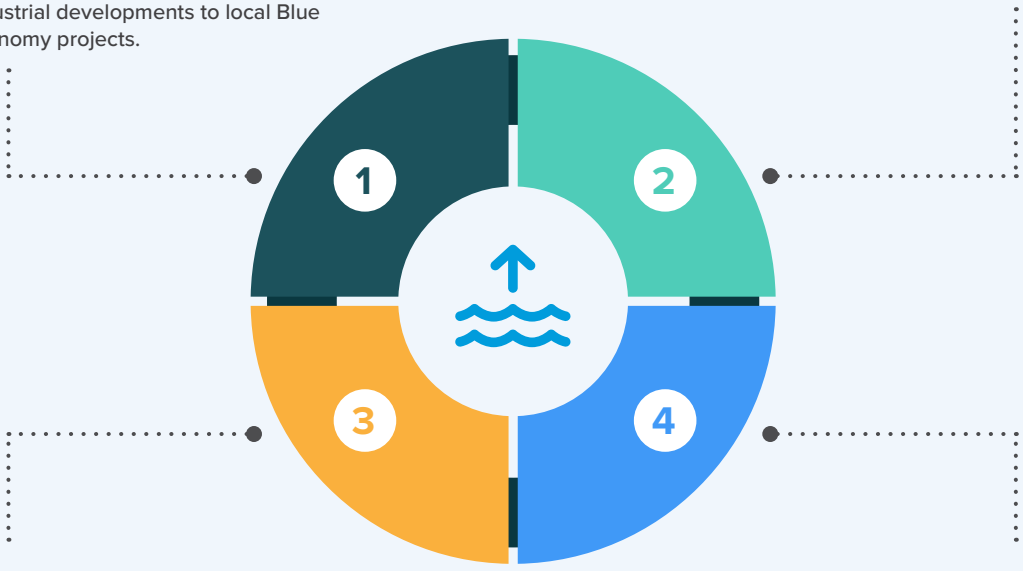
FIGURE 9: UNIDO's strengths with regard to Blue Industry development

Technical collaboration

Vast technical expertise, relevant experience and pertinent knowledge to support environmentally, socially and economically sustainable Blue Industry based on economic competitiveness and the circular economy. Transfer and retention of knowledge, experience and skills from global Blue Industrial developments to local Blue Economy projects.

Action-oriented research and policy advisory services

Partner for Blue Industry strategy development at the national, regional- and continental levels. Advise on Blue Industry readiness, such as optimizing local and regional fisheries, aquaculture, energy production, transport, and tourism developments.



Normative standards-related activities

Promote strengthening of regulatory capacities at the national and regional level. Support local and regional adoption of internationally accepted standards in areas such as aquaculture, fisheries and tourism. Lead national or regional efforts to devise Blue Industry Roadmaps aligned with the SDGs and emerging norms (e.g. on MPAs, deep-sea conservation, fishing subsidies etc).

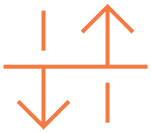
Fostering partnerships for knowledge and technology transfer

Strong network of partners and successful collaboration with a large group of stakeholders and strategic partner organizations, including international organizations, academia, regulators, large companies, small and medium-sized enterprises (SMEs), associations, clusters, industrial parks and financial institutions. Mandate and experience in collaborating with the private sector and developing entrepreneurship, as well as supporting the creation of business associations and improving the business environment within Blue Industry.

4.5 A NETWORK OF PARTNERSHIPS

The emergence of the sustainable Blue Economy and its strong interlinkage with the need to meet the SDGs, have reinforced the need for international organizations to establish strategic alliances and partnerships with a variety of collaborators. Partnerships with governments, multilateral institutions, the private sector, NGOs, foundations, financial institutions and academia prove the crucial role of UNIDO in bringing together the relevant and complementary partners and leveraging them to enhance development impact and advance both the sustainable Blue Economy and the emerging Blue Industry agendas.

In order to advance inclusive and sustainable industrial development through Blue Industry, UNIDO engages in a wide range of **multilateral fora**. For example, it is an Affiliated Partner of the Global Sustainable Seafood Initiative to promote alignment between businesses, NGOs, governments, and international organizations.



UNIDO's unique role as a **bridge between the Global South and the Global North** shines through its partnerships. For example, UNIDO and SIDS DOCK have launched the Global Ocean Energy Alliance, a platform to connect SIDS and coastal developing countries of the Global South with the emerging ocean renewable energy industry and blue and green concessional finance and venture capital of the Global North.

UNIDO's deep and wide portfolio of Blue Industry projects worldwide highlights the Organization's desire and ability to partner with **governments**, for example with Mozambique and Somalia, on their respective Blue Economy strategies.

UNIDO is particularly well placed to strengthen **regional cooperation** on the Blue Economy and Blue Industry. An example is its work on PROFISHBLUE in the SADC Region, working closely with the African Organization for Standardization, FAO, WWF, and WorldFish.

UNIDO strongly believes in collaboration with the **private sector and financial institutions**, and in their crucial role in development and economic advancement. UNIDO strives to maximize cross-sectoral linkages within Blue Industry, for example via its work on promoting integrated polyculture farming combining shrimp farming and mangrove restoration in Indonesia.

In terms of its approach to building networks of partners in Blue Industry, UNIDO takes a **value-chain approach**. This is reflected in its projects on circular value chains, for example the SwitchMed Blue Economy initiative.

SUMMARY

Implications for UNIDO's Blue Industry Programmatic Framework

The UNIDO Blue Industry Programmatic Framework aims to foster the integration, optimization and scale-up of the impact of UNIDO's interventions in the field of the Blue Economy, supporting the development of inclusive and sustainable blue industries that effectively contribute to sustainable development and the 2030 Agenda for Sustainable Development. The Theory of Change that underpins the programmatic framework is structured around key conditions, required contributions, anticipated outcomes, transformations and expected impact.

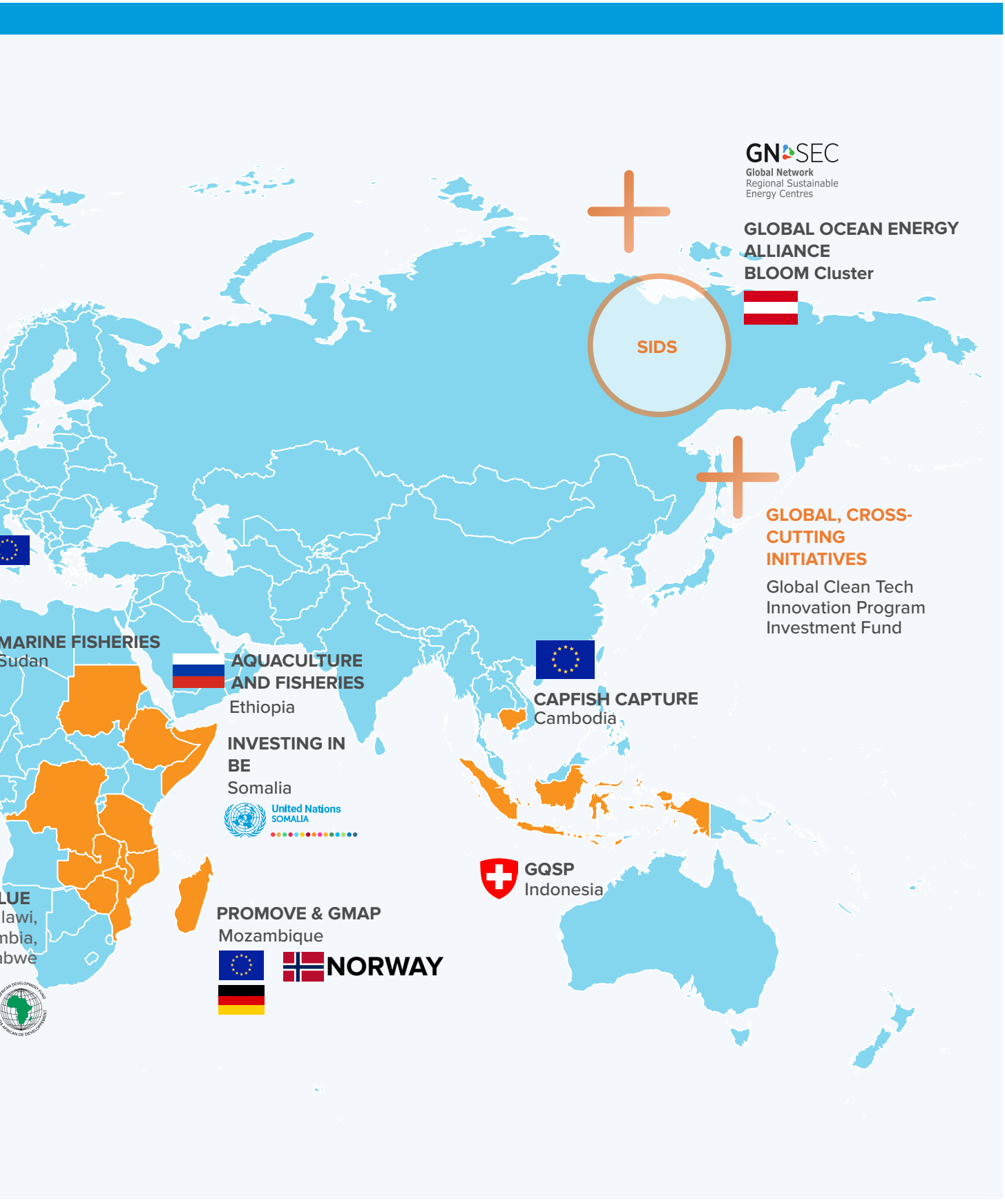
UNIDO promotes a holistic approach to development and is striving to increase its impact by combining interventions at the policy, institutional and enterprise levels. When operating in the field of Blue Industry, interventions follow several core principles such as advocacy for a regional approach, attaining international standards, promoting advanced technologies and innovation, ensuring Blue Industry makes a significant contribution to the SDGs, gender mainstreaming, emphasis on social inclusion along value chains, and partnerships at all levels (global, regional, national, local).

UNIDO provides its support through four mandated functions: technical cooperation; action-oriented research and policy-advisory services; normative standards-related activities; and fostering partnerships for knowledge and technology transfer.

UNIDO is bringing together relevant and complementary partners and leveraging them to enhance development impact and advance both the sustainable Blue Economy and the emerging Blue Industry agendas, for example through a network of partnerships in multilateral fora, bridging between the Global South and the Global North, partnering with governments, strengthening regional cooperation, working with the private sector and financial institutions, and taking a value-chain approach.

In recent years, and consistent with requests from its Member States, UNIDO has upscaled its outputs significantly with regard to normative, data collection and dissemination of global, regional and national industrial statistics, most notably through its flagship Industrial Statistics yearbook, as well as its Industrial Analytics Platform. There may be some potential to expand this capacity to collate Blue Industry/Blue Economy related data, contingent upon the mobilization of additional, ear-marked resource streams.

FIGURE 9: Global map of UNIDO projects pertaining to Blue Industry


GN SEC
Global Network
Regional Sustainable
Energy Centres
GLOBAL OCEAN ENERGY
ALLIANCE
BLOOM Cluster
SIDS
GLOBAL, CROSS-
CUTTING
INITIATIVES
Global Clean Tech
Innovation Program
Investment Fund
MARINE FISHERIES
Sudan
AQUACULTURE
AND FISHERIES
Ethiopia
INVESTING IN
BE
Somalia
United Nations
SOMALIA
CAPFISH CAPTURE
Cambodia
GQSP
Indonesia
LUE
lawi,
mbia,
abwe
PROMOVE & GMAP
Mozambique
NORWAY

5

Proven methodologies and approaches

UNIDO currently provides a comprehensive range of support activities and partnerships to assist developing countries in the Global South, including LDCs and SIDS, implement their blue and green economy aspirations.

UNIDO currently provides a comprehensive range of support activities and partnerships to assist developing countries in the Global South, including LDCs and SIDS, implement their blue and green economy aspirations. The Organization has extensive experience contributing to various components of the Blue Economy, including fisheries, aquaculture, marine biotechnology, sustainable energy, climate adaptation, ocean-based commerce and trade, investment promotion and facilitation, and innovative finance. Furthermore, UNIDO improves the livelihoods of coastal communities, ecosystem-based management of water habitats and market access for sustainable fisheries products in Latin America, Africa, and Asia.

UNIDO's well-established systematic Blue Industry approach to value-chain development provides a comprehensive framework that has proved to be of great value to the Blue Economy agenda. In particular, UNIDO possesses significant experience and know-how in the following areas:

1. Contributing to international agenda-setting;
2. Advancing good governance and blue policies;
3. Unlocking trade opportunities;
4. Building capacities among the blue private sector;
5. Attracting investments/FDI and mobilizing innovative finance;
6. Boosting blue innovation, technologies and entrepreneurship;
7. Maximizing cross-sectoral linkages within Blue Industry;
8. Promoting circularity and resource efficiency;
9. Catalyzing the potential of ocean-based energy sources; and
10. Promoting the sustainable development of blue food

These unique skills and experience can be harnessed to strengthen Blue Industry's transformative contribution to the Blue Economy

5.1 CONTRIBUTING TO INTERNATIONAL AGENDA-SETTING

Recognizing that blue industries can only be advanced through collaborative action, UNIDO works to convene global stakeholders to discuss Blue Economy challenges, opportunities, and best practices. UNIDO is not only a trusted partner to many working groups, platforms, and initiatives but also hosts Blue Economy events to bring together stakeholders with diverse backgrounds within Blue Industry. The Organization is committed to ensuring sustainable blue industries remain a priority and receive the required attention at the national, regional, and global level.

For example, UNIDO's recognized expertise in Indonesia resulted in co-chairing with the government the National Blue Agenda Actions Partnership and leading the Blue Food pillar. UNIDO is also partnering with the government of Nigeria in the development of the industry policy that will help in achieving sustainable growth in the sector while bolstering fishery capacities as part of the country's efforts for economic diversification and achieving self-sufficiency in food production. At the multilateral level, cooperation with regional organizations and counterpart United Nations entities is also vital, with UNIDO engaging extensively with international coordination bodies such as UN systemic fora (most notably UN Development Group), the G20, the European Union, African Union, ASEAN and the OECD inter alia.

In Mozambique, UNIDO is contributing to the Blue Economy Working Group established as a platform for coordination among development and cooperation partners and for policy dialogue between the development partners and the government on matters related to the topic.

UNIDO is also building on the results achieved within the Productive Sectors Development Joint Programme Food and Agriculture Organisation (FAO)-ILO-UNIDO for Somalia, where a national Blue Economy Strategy has been formulated, UNIDO is now partnering with FAO and UNDP for scaling up the opportunities identified.

Under the Global Network of Regional Sustainable Energy Centers (GN-SEC) program, which comprises ten regional centers affiliated with various regional economic communities in Africa, Asia-Pacific, Latin America and Caribbean, UNIDO is promoting south-south and triangular cooperation activities on renewable ocean energy technologies for the benefit of the Global South, including through the Global Ocean Energy Alliance (GLOEA) in SIDS.

UNIDO could strengthen its role in international agenda-setting even further by hosting a bi-annual event on Blue Industry at its headquarters in Vienna. These flagship events could be complemented by regional gatherings that focus on regionally relevant case studies that can be scaled up as well as opportunities for cross-regional exchange.

The Organization could also investigate the possibilities for enhancing collaboration at the regional level with respect to mapping of Blue Industries, with the findings forming the incipient step for recommendations for future technical cooperation, policy and convening operations, in close collaboration with national governments and actors on the ground.

5.2 ADVANCING GOOD GOVERNANCE AND BLUE POLICIES

Good governance is among the most important factors in the Blue Economy as it is a key condition to economic development, livelihood generation, social inclusion, and environmental protection. As such, UNIDO has been focusing on supporting countries to develop sound governance and policies to advance blue ecosystem protection as well as poverty reduction. UNIDO has a strong track record in working on good governance[83] and has provided state-of-the-art training in this area, for example on good governance in quality infrastructure.[84]

This is a key element of UNIDO's programme to enhance market access for firms in developing countries, ensuring high product quality, compliance with standards, certification, accreditation and metrology, in order to access higher-value markets in the Global North, thus upscaling productivity and added value.

UNIDO is also assisting Member States with evidence-based regulatory, policy and normative advice concerning

83) https://www.unido.org/learning-resources/good-governance-quality-infrastructure

84) https://hub.unido.org/news/unido-launches-online-training-good-governance-quality-infrastructure

best practices for successfully harnessing Blue Industry's contribution to the Blue Economy. This includes facilitating the harmonization of standards and regulatory frameworks across different sectors of the Blue Economy, ensuring alignment with international best practices and reducing technical barriers to trade. For example, to help strengthen joint efforts to promote sustainable production and consumption in the seafood industry, since 2021, UNIDO has joined the Global Sustainable Seafood Initiative (GSSI) as an Affiliated Partner. GSSI's Seafood Map aims to revolutionize the fragmented system into an equitable, resilient, and sustainable one by providing new ways for producers globally to learn, connect to markets, find technology solutions, and understand investment opportunities.[85] Within this partnership, UNIDO contributes as a specialized agency with specific trade-related capacities to operationalize internationally negotiated instruments, promoting alignment between businesses, NGOs, governments, and international organizations to accelerate sustainability and the implementation of the UN Sustainable Development Goals (SDGs).

Additionally, UNIDO could play a key role in supporting regulatory frameworks for emerging blue sectors, including seabed mining and BlueTech. Given the environmental and governance risks associated with seabed resource extraction, UNIDO can advocate for the development of internationally aligned safeguards, ensuring that resource utilization is sustainable and does not compromise marine biodiversity. Similarly, in the rapidly evolving BlueTech sector UNIDO can assisting policymakers in designing regulatory frameworks that foster innovation while maintaining ethical and environmental integrity.

5.3 UNLOCKING TRADE OPPORTUNITIES

UNIDO has long-standing expertise and experience in promoting fair and responsible local industrial production and trade of blue products. Blue value chains are essential tenants of nations' economic resources, and the sustainable development of such resources is an important driver of job creation and economic development. From supporting governments to develop and implement strong trade policies and standards to training SMEs and entrepreneurs on the sustainable development of blue products, UNIDO is supporting developing countries to increase market access and the trade of internationally-compliant products. In addition to supporting individual countries, UNIDO also advises regional entities to harmonize trade requirements and develop strategies for intra-regional trade of blue products.

For example, the Global Market Access Programme (GMAP) supports interventions in Mozambique and Colombia (targeting the fisheries and aquaculture value chains) to address quality-related and other barriers to accessing markets at the macro, meso, and micro levels. Also in Mozambique, UNIDO implements the PROMOVE Comércio project, focusing on improving the trade and business environment for the fisheries and agri-business value chains.

In addition, UNIDO promotes the development of small-scale fishing to increase exports to countries in the sub-region, contributing to food security and job creation in Guinea-Bissau. Interventions in Somalia aim to enhance skills and production to achieve market access for fishery products. UNIDO also strengthens institutional capacities in Cambodia and Sudan, supporting inclusive post-harvest fisheries value chain development and sustainable fisheries management, including through investment facilities.

85) https://seafoodmap.org/seafood-map/

Project Highlight

PROJECT SCOPE

Programme for Improving Fisheries Governance and Blue Economy Trade Corridors in the SADC Region (PROFISHBLUE).

OVERVIEW AND MAIN OBJECTIVES

PROFISHBLUE is a 4-year African Development Fund (ADF)-financed project with the objective to promote sustainable management of fisheries resources within the Blue Economy context in order to improve food and nutritional security, create employment through value-chain activities, facilitate intra-regional trade, and build adaptive capacity against climate change and other external shocks. UNIDO interventions, which are due to be completed by the third quarter of 2025, are aimed at supporting trade facilitation and policy harmonization for fisheries products through optimizing the 'One Stop Border Post' programme across six bordering countries (DRC, Malawi, Mozambique, United Republic of Tanzania, Zambia, and Zimbabwe). UNIDO is also providing business development services, accelerator, and incubation/investment support for women and youth SMEs in fish trade (DRC, Madagascar, Malawi, Mozambique, URT, Zambia, Zimbabwe).

RESULTS OBTAINED / EXPECTED

Under component 2A, UNIDO has provided 40 laboratory officials with training on meeting important standards for fish trade as well as prepared procurement for the purchasing of much-needed inspection equipment to be delivered to 8 targeted OSBPs. Furthermore, UNIDO has published a report highlighting core fisheries data in the target SADC countries, the requirements for trade under OSBPs, and the current status of Quality Infrastructure in the region. The key findings from this report will be used by UNIDO to develop a regional strategy for fisheries trade under OSBPs. Under component 2C, UNIDO has trained 52 trainers (including 32 women) from 12 BDI's in the fisheries sector. Trainings have focused on enhancing SME's capacity to trade by supporting business skills & circular and IT tools to help (aspiring) entrepreneurs transform their project idea into a business model and plan in the fishery sector.

5.4 BOOSTING BLUE INNOVATION, TECHNOLOGIES AND ENTREPRENEURSHIP

Competitive, safe, reliable and cost-effective goods and services are an important prerequisite for enhancing an industry's competitiveness and export market share in tradable goods and services.[86] Industries therefore have an ongoing need for market information, know-how, restructuring and upgrading. This is often supported by investment and technology inflows for process upgrading, as well as by productivity and quality management improvement. UNIDO is applying this approach to Blue Industry too.

For example, UNIDO is supporting the leveraging of energy-to-waste processes to combat invasive species, such as Sargassum, for renewable energies in Belize, and creating a capacity assessment and a standardized training package for solar photovoltaics and thermal components and services in the Pacific region.

For many years, UNIDO has assisted developing countries and SIDS in the development and implementation of renewable energy and energy efficiency projects for marine or coastal productive uses and the decarbonization of the expanding blue industries. This includes countries such as Cape Verde, Guinea Bissau, Sao Tome and Principe, Indonesia, and the Caribbean and Pacific islands through regional approaches. Programs, such as the Global Clean Tech Innovation Program, the Private Financing Advisory Network or the Bloom Cluster in Barbados, have supported businesses and start-ups in blue clean technology products and services (e.g. use of seaweed for renewable energy and/or other productive uses). The UNIDO Industrial Energy Efficiency Programme has a recognized potential to address energy management of energy-intensive blue industries. UNIDO also has a long track record and expertise in the area of small hydropower. In 2023, UNIDO's portfolio of field projects included 21 operational small hydropower plants and 18 under construction.

While UNIDO's programs have achieved significant success in fostering renewable energy and decarbonization projects, the rapidly evolving demands of the Blue Economy call for dedicated mechanisms to support early-stage and scaling innovations. Incubator and accelerator programs can provide the necessary infrastructure, resources, and partnerships to nurture transformative solutions and drive systemic impact in the Blue Industry.

As part of UNIDO's outreach in formulating this conceptual framework, a number of ways in which digital transformation could be brought to bear in a positive fashion for the blue economy were identified, inter alia:

- Enhanced monitoring and management of marine ecosystems;
- Improving fisheries and aquaculture by optimizing fishing practices, predict fish stock levels, and enhance aquaculture operations;
- Enhancing coastal tourism by improving tourist experiences, manage visitor flows, and protect coastal ecosystems;
- Supporting sustainable blue energy development by optimizing the placement and operation of offshore renewable energy installations, contributing to the growth of sustainable blue energy sectors;
- Improving maritime trade and transportation by enhancing port operations, optimize shipping routes, and improve maritime safety;
- Addressing climate change impacts by helping in predicting and mitigating the effects of climate change on coastal areas, such as sea-level rise, erosion, and extreme weather events.

86) https://www.unido.org/investing-technology-and-innovation

Project Highlight

PROJECT SCOPE

UNIDO Cooperation with the Scientific and Technological Research Council of Türkiye (TÜBITAK) on the Global Cleantech Innovation Programme (GCIP).

OVERVIEW AND MAIN OBJECTIVES

The GCIP transforms early-stage innovative cleantech solutions into scalable enterprises, strengthens the capacities of cleantech innovation and entrepreneurship ecosystem stakeholders and increases the connection between them. Each year, applications are gathered from seven clean tech categories and water efficiency is one of them. Water efficiency as a clean tech category, includes technologies which address drinking water distribution, usage or treatment, recycling and reuse of industrial and household water and in-sludge management, exploitation of alternative resources for production of clean water and the attempt to integrate both waste and water management. Solutions can include purification, water saving devices, rain-harvesting systems and water monitoring systems for efficient water consumption.

RESULTS OBTAINED / EXPECTED

During the 2024 GCIP accelerator, the water efficiency category composed 12% of all applications received and 5% of the accepted teams. During GCIP Accelerators, teams receive training from international trainers and complete various assignments under the guidance of their assigned mentors. Additionally, they are trained to calculate their GHG emission mitigation levels and to measure their contributions to the SDGs.

In the 2023 edition, the runner-up VesselX provided innovative solutions for waste collection and environmental management problems in marine and coastal areas. Overcoming the limitations of traditional methods, it effectively identifies and collects trash, oil, and pollutants on the water surface using artificial intelligence and navigation algorithms. This innovative solution saves time, reduces dependence on fossil fuels, and helps maintain the cleanliness of water areas.

Project Highlight

PROJECT SCOPE

The Barbados Bloom Cleantech Cluster.

OVERVIEW AND MAIN OBJECTIVES

The Barbados Bloom Cleantech Cluster is a Global Environmental Facility (GEF)-funded initiative established in Barbados to promote sustainable energy and climate technology through industrial development and entrepreneurship. The Cluster is managed by Export Barbados, with assistance from UNIDO and oversight from the Ministry of Industry, Innovation, Science and Technology.

Bajan entrepreneurs have been limited in their ability to develop, plan, install and maintain new, green technologies. With a focus on sustainable energy technology innovation, industrial development and entrepreneurship, Bloom is building partnerships between the Barbados government, local businesses, citizens and the academic community. Through these partnerships, Bloom is positioned to help Bajan cleantech projects and entrepreneurs flourish.

Bloom offers a mix of incubation and accelerator services to nurture growth, including access to project and venture capital financing; business intelligence services; market, technology and IP research; matchmaking with international investors and partners; training and capacity-building; and export promotion.

RESULTS OBTAINED / EXPECTED

The cluster offers a residential and virtual incubation programme for renewable energy startups, as well as personalized coaching and financial assistance for innovative entrepreneurs. With 14 startup agreements, it aims to build an innovation ecosystem for renewable energy and cleantech enterprises. The use of sargassum seaweed for productive uses, such as fertilizers, alternative plastics and alternative transport fuels has been an important focus.

5.5 BUILDING CAPACITIES AMONG THE BLUE PRIVATE SECTOR

Recognizing the importance of the private sector in sustainable Blue Industry development and employment, UNIDO works collaboratively with the private sector to enhance their competitiveness, efficiency, and sustainability. Capacity-building, finance, and business incubation for the private sector is a critical component of UNIDO's work, including in Blue Industry. UNIDO also ensures the inclusion of women and youth when providing assistance.

In Cape Verde and Latin America, for example, UNIDO supports Blue Economy actors to improve livelihoods and employment by supporting the incubation of youth and women-led businesses or business ideas, and provides technical assistance to upgrade the production processes of the selected value chains in the Blue Economy.

Meanwhile, in Honduras and El Salvador, UNIDO fosters regional integration and south-south cooperation in the aquaculture sector to create employment and reduce poverty.

Furthermore, at a regional level, UNIDO is assisting several countries in the SADC region, including DRC, Malawi, Zambia, Mozambique, Comoros, Zimbabwe, Madagascar, and the United Republic of Tanzania, through PROFISHBLUE. This project provides training to business development services and incubation/investment hubs for women and youth SMEs in fish trade.

Project Highlight

PROJECT SCOPE

CAPFISH Capture: Post-harvest fisheries development project in Cambodia.

OVERVIEW AND MAIN OBJECTIVES

With support of the European Union, the CAPFISH Capture: Post-harvest fisheries development project is implemented by UNIDO in coordination with the Fisheries Administration and the private-sector participants, universities, and support institutions. The EU provides budgetary support to strengthen the counterparts' implementing capacities, while UNIDO's intervention is designed to help build counterparts' technical and institutional capacity.

The objective of this project is to support post-harvest fisheries development through strengthening of the Fisheries Competent Authority, private sector development through fisheries value chain investment support, and demand-based research and innovation by universities to address the issues of the private sector. These three pillars of intervention, together with streamlining cross-cutting issues like gender, environment and social considerations, contribute to income and employment generation in the fisheries sector. The project is designed from the outset to transfer know-how and technical expertise to the local institutions and organizations. Through upgrading the private sector capacities, it is expected to achieve improved recognition of Cambodia fish products internationally, and especially in the EU markets, thus contributing to improved market access, increased investments in the sector and overall improved competitiveness.

RESULTS OBTAINED / EXPECTED

By 2025, the project aims to harmonize Cambodia's food safety systems with global requirements, increase private-sector competitiveness, expand fishery exports, and foster greater access to finance through an inclusive value chain financing mechanism.

RESULTS OBTAINED / EXPECTED

By 2024, the key achievements of the project included: development and implementation of voluntary food safety system, Cambodia Quality Seal (so far 17 enterprises have been certified); support to 28 enterprises (11 more in the approval pipeline) under the Value Chain Investment Support scheme, where project supported with around US$ 1 million in equipment and technical services provision, leveraging additional US$ 1.8 million of additional investment from the enterprises, increasing their production volume by 40%, and creating and retaining over 11,000 jobs (over 5,100 for women); development of over 200 business plans for enterprises, establishment and roll-out of an innovative blended finance mechanism, Investment Support Facility (ISF), which comprises a blend of grants, guaranteed loans and enterprises' own contribution, underpinned by technical assistance, and aims to support 100+ fisheries value-chain enterprises and their associated actors to upgrade their business, food-safety practices, productivity and exports to international markets. The ISF Pilot stage includes €500,000 of grant funds, which would leverage additional €750,000 in loans and enterprises' own investments, thus contributing to their financial inclusion and better access to financial services. The scheme can be easily scaled up and replicated in other agrifood value chains.

Moreover, the Food Technology, Research, and Innovation Platform (FTRIP), an innovative collaboration mechanism, was officially established with the project's support, bringing together the government, academia and private-sector actors. Under FTRIP, a Call for Proposals was launched, yielding a total of 23 research projects that were supported to address the concrete issues faced by the private sector, creating around 20 new products and innovative/improved technologies and involving over 80 research personnel and interns. A Packaging Center has been established in one of the universities, thus additionally strengthening the link between academia and the private sector and contributing to its competitiveness. Over 80 training events, benefiting over 2,400 participants were conducted.

5.6 ATTRACTING INVESTMENTS/FDI AND MOBILIZING INNOVATIVE FINANCE

Scaling up public and private investments and FDI in sustainable industrialization including Blue Industry is key to closing the SDG financing gap in developing countries and advancing the implementation of the SDGs. Industrial policies need to be complemented by integrated financing frameworks, including innovative financing mechanisms and blended finance. Besides financial support, developing countries need capacity-building and technical assistance to direct investments in sustainable industrial transformation and SDG acceleration, to ensure that investment projects relevant to the Blue Industry are adequately promoted and facilitated. Investment Funds aimed at derisking private investments in maritime-based projects could play a key role in stimulating bankable investments.

Investments in Blue Industry need to be large-scale, targeted and coordinated between the public and private sectors. Large-scale sustainable projects need significant domestic investments in infrastructure, but also significant private capital and investment incentives to facilitate, for instance, the energy transition. However, limited access to finance and difficulties in meeting investor requirements for attractive risk-return profiles pose bottlenecks for firms in developing countries. This is especially true for small and medium-sized enterprises (SMEs), which often lack the capacity to formulate viable, and therefore "bankable" investment projects for private lending institutions. To create an enabling business environment and ensure long-term sustainability, a clear government strategy as well as coordination among governments, their investment promotion institutions, development organizations, financial institutions, and the private sector are key. Regional investment fora, such as the Africa Investment Forum, can also play a vital role in catalyzing investment flows for Blue Economy endeavours.

Apart from traditional fiscal instruments such as subsidies, tax incentives or public procurement, innovative financial schemes are going to be of particular relevance to de-risking private investments or provide incentives to achieve development results and accelerate the SDGs. Blended finance that uses public funds to crowd in private finance is key to leveraging large-scale investments in support of national development priorities. By strategically combining public, philanthropic, and private funds, innovative finance schemes can mitigate perceived risks and enhance the attractiveness of investments that might otherwise be deemed too risky or unprofitable, such as for SMEs. Blended finance instruments include co-financing, guarantees, credit facilities, impact investments, and outcome-based financing. Targeted finance instruments are also beneficial to the creation of innovation ecosystems for startups, such as open calls for grants, the creation of digital hubs, progressive grants, and venture funds aimed at high risk, high reward projects.

Modern industrial policies that use a more expansive toolkit can play an important role in directing financing towards strategic investments and sectors that spur progress towards the SDGs. A global consensus has emerged that a new era of industrial policies is essential to support sustainable industrial transformation, the energy transition, digitalization, and resilience to economic and non-economic shocks.

5.7 MAXIMIZING CROSS-SECTORAL LINKAGES WITHIN BLUE INDUSTRY

The Blue Economy consists of multiple sectors ranging from well-established industries such as offshore wind energy, marine fisheries, maritime and coastal tourism, shipping, port infrastructure, to emerging industries such sustainable fisheries, biotechnology, tidal and wave energy, blue carbon, etc. The expansion of the blue economy and the growth of these sectors has been driven by demand for food security, healthcare, sustainable energy, digitalization and coastal urbanization. Blue Industries are connected to each other in different ways:

- They draw on common oceanic assets, and their long-term viability depends on productivity and sustainability of such ecosystem services, which are all impacted by climate change.
- There is competition, trade-offs and spillovers between industries to access resources.
- Beyond trade-offs, cross-sectoral innovations have been fueled by advances in digital technologies, biotechnology, food science and sustainability.
- Traceability has gained importance as a market requirement and digital technology can make a big difference in this regard, particularly in ensuring quality, safety of blue food and compliance of blue goods with environmental and social regulations.

Due to such interconnectedness between Blue Industries, cross-sectoral innovations have taken place such as integrated wind energy and aquaculture systems or nature-based solutions to coastal adaptation through cultivation of seaweed. Facilitating such cross sectoral initiatives not only creates additional economic values and opportunities, but it also reinforces sustainable development of blue industries.

UNIDO leverages its expertise to ensure the cross-fertilization of sectors within blue industries, establishing linkages in areas such as eco-tourism, fisheries, shipbuilding, and marine conservation, marine biotechnology, renewable energy, and pharmaceuticals. These linkages, in turn, lead to greater synergies, collaboration, and sustainable development.

Project Highlight

PROJECT SCOPE

Integrated polyculture farming combining shrimp farming and mangrove restoration in Indonesia.

OVERVIEW AND MAIN OBJECTIVES

UNIDO's support in Indonesia, through SMART-Fish (2014-2019) and GQSP (2019-2027) extends to various fisheries and aquaculture products, including seaweed, enhancing their role in economic development, climate adaptation, and mitigation. UNIDO's support during the last decade spans topics such as:

- Strengthening the innovation ecosystem for development (e.g. Tropical Seaweed Innovation Network);
- Mainstreaming sustainable practices along the value chain to enhance productivity, quality and sustainability of products;
- Enhancing skills and technology development capacity (through enhancing curriculum of technical and vocational training institutions and strengthening industry academia linkages);
- Establishing effective skills and technology transfer mechanisms (e.g. through blended e-learning, national extension services, etc.);
- Upgrading national standards and quality infrastructure;
- Establishment of electronic traceability systems and sustainability certification; and
- Establishment of national public-private dialogue and providing tangible and effective policy recommendations that have been adopted by the Government of Indonesia.

RESULTS OBTAINED / EXPECTED

As part of its intervention in Indonesia, UNIDO promotes integrated polyculture farming combining shrimp farming and mangrove restoration. This practice is environmentally friendly, has low stocking density and allows traditional polyculture farmers to maintain the mangrove in their ponds and thus preserve their important contribution to ecosystem health and sustainability of production. Moreover, the mangrove preservation areas are promoted as eco-tourism destinations, which generates additional income support activities for farmers

RESULTS OBTAINED / EXPECTED

as an incentive for mangroves conservation and rehabilitation as well as a means of raising social awareness on the important role of mangroves in protecting natural ecosystems and enhancing ecosystem services in coastlines. This approach not only fosters creation of higher economic value from traditional farms, but also provides livelihood and builds resilience of coastal communities to climate change effects.

5.8 PROMOTING CIRCULARITY AND RESOURCE EFFICIENCY

The transition to a circular economy aims to adopt resource-efficient and cleaner production systems to allow companies to increase their competitiveness while protecting the environment. Several UNIDO projects focus on identifying and promoting circular value chains as well as climate change mitigation and adaptation practices. For instance, within the SwitchMed Blue Economy initiative, UNIDO implements resource-efficient production practices in Tunisia and Morocco's fish processing and aquaculture sectors. UNIDO's Global Cleantech Innovation Programme 2023 Global Forum also selected a winner from a company called ZeroCircle which is making products from seaweed, including pellets, packaging, and coatings.

Project Highlight

PROJECT SCOPE

SwitchMed Blue Economy initiative.

OVERVIEW AND MAIN OBJECTIVES

SwitchMed supports and scales up the transition towards sustainable consumption and production in eight countries of the Southern Mediterranean through: regional and national policy strengthening, skills, development and pilot demos on resource efficiency, circular business models, and networking activities.

For Morocco, the Initiative has two core objectives: 1) demonstrate the business case for resource efficiency in the fish processing industry; and 2) promote the valorization of the fish processing industry byproducts for high value-added markets. For Tunisia, the Initiative aims at promoting sustainable aquaculture practices in the Mediterranean.

RESULTS OBTAINED / EXPECTED

Since 2020, the SwitchMed II programme has extended the principles of the circular economy to businesses within the blue economy in Morocco and Tunisia in line with the European Union's “blue growth" strategy.

For Morocco, 45 resource efficiency measures have been identified, corresponding to a total of €13.3 million investments with an overall payback period of less than two years, that can lead to 38% energy reduction, 24% water savings and 25% raw materials recovery.

For Tunisia, five SMART technologies were selected and transferred (AI software, remote telecommunication 4G, underwater cameras, homogeneous distribution systems, and renewable energy). When fully implemented these have the potential to save 20-30% Feed Conversion Ratio Optimization, 1.5 tons of nitrogen and 0.2 tons of phosphorus avoided discharge in the marine environment, and a €33,000 payback period less than 4 months. The national upscale potential includes 23,000 tons of fishfeed saving, equivalent of €21 million per year, avoiding 1,000 tons of nitrogen and 131 tons of phosphorus discharge into the environment.

5.9 CATALYZING THE POTENTIAL OF OCEAN-BASED ENERGY SOURCES

UNIDO is experienced in energy-related activities, including the promotion of renewable sources of energy, the facilitation of productive activities in rural areas and in industrial processes.[87] UNIDO has started to apply these skills in ocean-based energy in recent years.

In 2022, UNIDO and SIDS DOCK launched the Global Ocean Energy Alliance (GLOEA), which provides a platform to connect SIDS and coastal developing countries of the Global South with the emerging ocean renewable energy industry and blue and green concessional finance and venture capital of the Global North. The initiative has the support of various prime ministers and energy ministers from SIDS in Africa, the Caribbean, the Indian Ocean and the Pacific. The GLOEA is part of the south-south and triangular cooperation programs promoted under the Global Network of Regional Sustainable Energy Centres (GN-SEC) umbrella. Under the alliance, UNIDO has started supporting several SIDS in developing projects to promote the adoption of ocean energy technologies as well as renewable energy and energy efficiency solutions tailored for industries of the Blue Economy.

87) https://www.unido.org/our-focus-safeguarding-environment-clean-energy-access-productive-use/renewable-energy

Project Highlight

PROJECT SCOPE

Global Ocean Energy Alliance (GLOEA).

OVERVIEW AND MAIN OBJECTIVES

GLOEA is a joint partnership between SIDS DOCK, UNIDO, GN SEC and ACRE focused on mitigating barriers for ocean energy development in SIDS and coastal LDCs. The objective is to promote green and blue economies by contributing to energy and food security, productive uses, reduction of marine pollution and GHG emissions, as well as climate change adaptation.

The Alliance accelerates the deployment of ocean energy technologies and projects through partnerships that mobilize technical, human and financial resources. It provides a bridge between industry and research players who need to test new solutions in various climates and contexts, and the interest of SIDS and coastal countries to get access to technology and expertise. Moreover, it establishes a global community of vested interest with the capacity to develop a pipeline of bankable ocean energy projects. It also provides virtual markets and an information exchange hub for south-south and triangular cooperation and learning. The Alliance emphasizes “learning by doing” and the facilitation of a growing pipeline of pilot and investment projects attracting foreign direct investment, commercial and concessional finance.

RESULTS OBTAINED / EXPECTED

Advocacy and knowledge transfer is being achieved by establishing a global community, including major ocean energy industry associations, international technology development programmes, national applied research and testing centers. The Alliance contributes to marine and coastal industries’ greening efforts by transferring emerging SIDS-appropriate ocean energy technologies that are expected to achieve cost reductions through economies of scale in the long run. Overall, the technology will provide energy services to coastal communities and contribute to the decarbonization of Blue Industry

5.10 PROMOTING THE SUSTAINABLE DEVELOPMENT OF BLUE FOODS

As fisheries and aquaculture is a critical source of protein, an important driver of economic growth, a key contributor to livelihood opportunities, and a major component of a healthy environment, UNIDO has been emphasizing projects in this sector for many years. UNIDO recognizes that an entire ecosystem of partners work in this space, and therefore the Organizations' interventions have focused primarily on supporting developing countries to sustainably scale-up blue food industries by enhancing market access and trade opportunities. This is primarily done through supporting national governments to develop and implement strong fisheries and aquaculture policies and standards as well as supporting officials with inspection, testing, and certification of blue foods. In addition, UNIDO supports the fisheries and aquaculture private sector (such as SMEs and entrepreneurs) to build their capacity to process fish, obtain financing, meet international health and safety standards, and access local, regional, and international markets.

Project Highlight

PROJECT SCOPE

Global Market Access Programme (GMAP) Colombia and Mozambique.

OVERVIEW AND MAIN OBJECTIVES

GMAP is a multi-year initiative funded by NORAD, designed to enhance the competitiveness of SMEs in international markets, with a particular focus on the blue foods sector, contributing to the sustainable and inclusive development of the targeted countries. The project aims to improve market access for SMEs involved in fisheries, aquaculture, and other blue foods value chains by strengthening quality infrastructure, ensuring compliance with international standards, and fostering a culture of quality. Through this, GMAP supports the growth of blue food industries, empowering SMEs with the necessary tools, knowledge, and systems to meet global standards and gain access to international markets, ultimately stimulating economic growth and enhancing food security in the target regions.

RESULTS OBTAINED / EXPECTED

In Mozambique, the GMAP intervention is strengthening the blue foods sector by enhancing biosecurity, streamlining licensing processes, and improving product marketing standards. The development of two national aquaculture norms and the adoption of Best Management Practices are expected to increase the competitiveness, productivity, and compliance capacities of SMEs. By the project's completion, businesses in the sector will be better positioned to meet international standards, including HACCP certification, enabling them to access higher-value markets.

In Colombia, GMAP has driven significant progress in the blue foods sector by aligning local practices with international standards such as Global G.A.P. and Codex Alimentarius. Cost-effective testing materials and stronger regulatory frameworks have enhanced compliance, while support for SMEs has led to 26 new and renewed certifications. Efforts to improve quality assurance, promote women's participation, and strengthen institutional inspection capacities will ensure long-term sustainability and market access for Colombian blue food products.

The way forward: Recommendations for UNIDO's future Blue Industry Programmatic Framework

UNIDO has a unique mandate: to promote and accelerate inclusive and sustainable industrial development in its Member States. This gives the Organization a distinctive role within the Blue Economy ecosystem to focus on better integrating the Blue Economy and Blue Industry into SDG9, while also highlighting the role of Blue Industry in meeting the 2030 Agenda for sustainable development.

Given the substantive experience accumulated and the diversity of proven approaches and methodologies, the Organization is developing a comprehensive programmatic framework to integrate, optimize and standardize UNIDO´s approach to Blue Industry, increase partner and resource mobilization and scale up the impact of interventions. This section highlights some of UNIDO's plans for its future Blue Industry Programmatic Framework.

While UNIDO has good involvement in a number of key blue sectors, such as energy and fisheries, the Organization has less direct involvement in tourism, deep-sea mining, marine biotechnology, shipping and ports, ocean data, and blue finance. Recognizing these sectors as vital blue industries, UNIDO will aim to push further action into these critical blue sectors. The Organization has particular expertise with respect to capacity building in feasibility studies and investment promotion for critical infrastructure, such as ports, developing innovation ecosystems and clustering for upscaling biotechnology.

As the champion for Blue Industry within the wider Blue Economy ecosystem, UNIDO is aiming to prioritize the **harmonization and mainstreaming of Blue Industry in the Blue Economy agenda**. UNIDO will strengthen work with other Blue Economy stakeholders to mainstream Blue Industry in Blue Economy fora, including for example the World Ocean Summit, the UN Ocean Conference, and key global initiatives such as the Ocean Breakthroughs, thereby accelerating global efforts to integrate Blue Industry as a key pillar of sustainable ocean economies.

Additionally, UNIDO will engage in key processes such as the blue standard-setting . UNIDO will also use its convening and agenda-setting power to host a bi-annual event on Blue Industry at its headquarters in Vienna. These flagship events could be complemented by regional gatherings that focus on regionally relevant case studies that can be scaled up as well as opportunities for cross-regional exchange. Ultimately, these efforts could support consensus-building for global governance mechanisms around Blue Industry.

Drawing on its expertise in agenda-setting and good governance, UNIDO will also aim to **support countries and regions (notably in the SIDS, LDCS and MICs) in evolving their Blue Economy strategies** and policies to include the opportunities provided by Blue Industry. UNIDO already has significant experience in fostering regional cooperation on the Blue Economy and Blue Industry, e.g. through PROFISHBLUE in the SADC Region, working closely with the African Organization for Standardization, FAO, WWF, and WorldFish. UNIDO is well-placed to build

on this experience and work with regional organizations, such as the AU, ASEAN and IGAD, to update their Blue Economy Strategies with significant focus on a coherent Blue Industry strategy. UNIDO could also help individual Member States with their Blue Industry strategies, benefiting from cross-country and cross-regional learnings as well as experience with mainstreaming and harmonization.

UNIDO is also looking to lead the process of **connecting Blue Industry to global targets and solutions**, most notably the 2030 Agenda for Sustainable Development, climate action (including net zero), nature restoration, pollution control, food security, the energy transition, and sustainable value chains. As this report has shown, Blue Industry has major contributions to make to all SDGs (not just SDG14), while also offering solutions to climate change (e.g. via blue foods, ocean-based energy, shipping decarbonization, and blue carbon ecosystems). UNIDO can help to define the role of Blue Industry in key transition to a regenerative future, notably the energy transition (with the share of ocean-based energy rising in the global energy mix) and the food system transition (with blue foods being increasingly embraced not only for their climate mitigation potential but also to promote healthy diets). As Blue Industry value chains become increasingly complex and intertwined, UNIDO can become a leader in regenerative value chains for the Blue Economy. In doing so, UNIDO could be at the forefront of defining what regenerative business means in the Blue Economy, helping blue industries meet economic, social and environmental goals in service of people and planet.

Building on the proven methodologies and approaches identified in this report, UNIDO should create a **systematic database of working and published papers, case studies and best practices** to support knowledge transfer, knowledge-sharing and cross-sectoral linkages. As a convenor, UNIDO could expand the scope of this database, assisting in the identification of opportunities for international and regional collaboration and partnerships.

In order to ensure that the efforts around consensus-building, harmonization and cross-industrial as well as cross-regional cooperation are driven by clear impact metrics, UNIDO will define a set of objectives (guided by the 2030 Agenda) for Blue Industry, including those listed below.

Main UNIDO objectives for Blue Industry

- developing innovating incumbent and emerging industries around the Blue Economy;
- accelerating decarbonization of Blue Industry and ocean energy for productive uses;
- advancing digital transformation for sustainable aquatic ecosystems;
- strengthening healthy human and aquatic ecosystems;
- boosting local innovation, global solutions;
- developing and strengthening tangible and intangible resources for industrial development (e.g. addressing gaps in skills and knowledge); and
- developing, linking and harmonizing industrial policy.

The Organization will marshal its key inputs (such as its technical cooperation services, knowledge networks, policy research and normative capacities, its convening role and its close relationship with its Member States and other international bodies); resources (financial and otherwise, such as the UNIDO Field Network and the Investment and Technology Promotion network); and capabilities (such as industrial development expertise, convening capacity and partnership formation, thought leadership and advocacy) in pursuit of leveraging the full mobilization of Blue Industry's contribution to the Blue Economy.

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