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Marine Debris in Circular Economy

2b. Blue Economy Industries and Plastic Pollution

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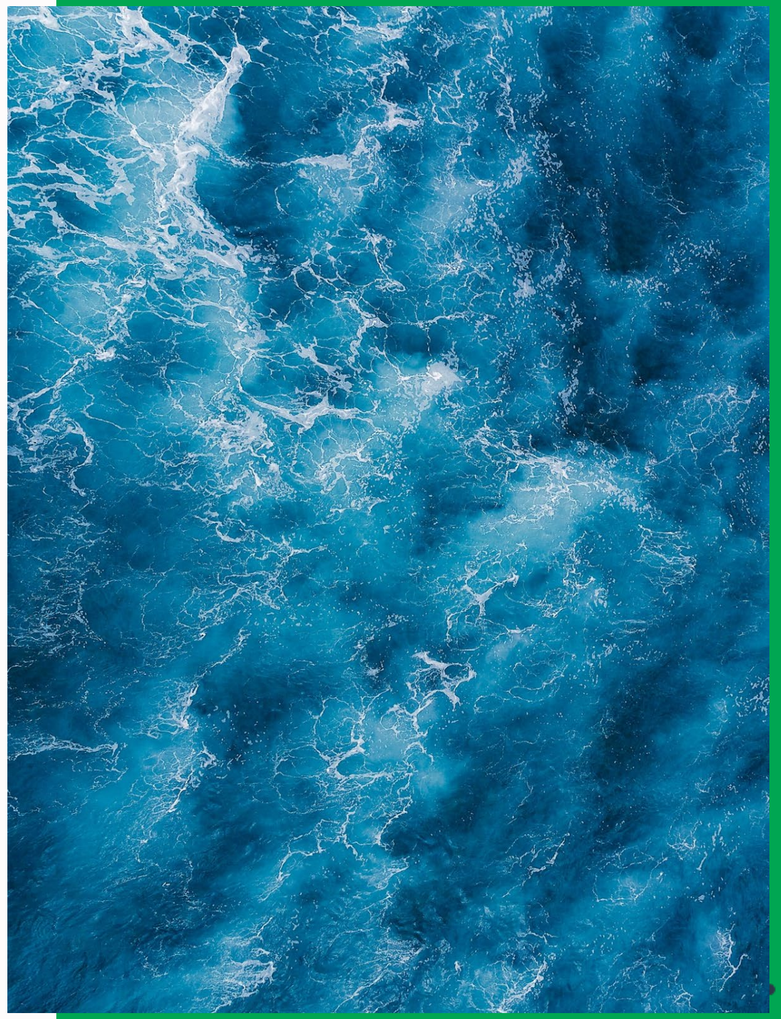
Content



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Introduction

Objective:

- To identify key challenges contributing to plastic pollution within blue economy industries
- To explore opportunities and strategies to reduce plastic pollution

Learning Outcomes:

- Describe the sources and impacts of marine debris on the Blue economy.
- Present the role of blue economy industries in plastic pollution generation and potential solutions and waste reduction and recycling.

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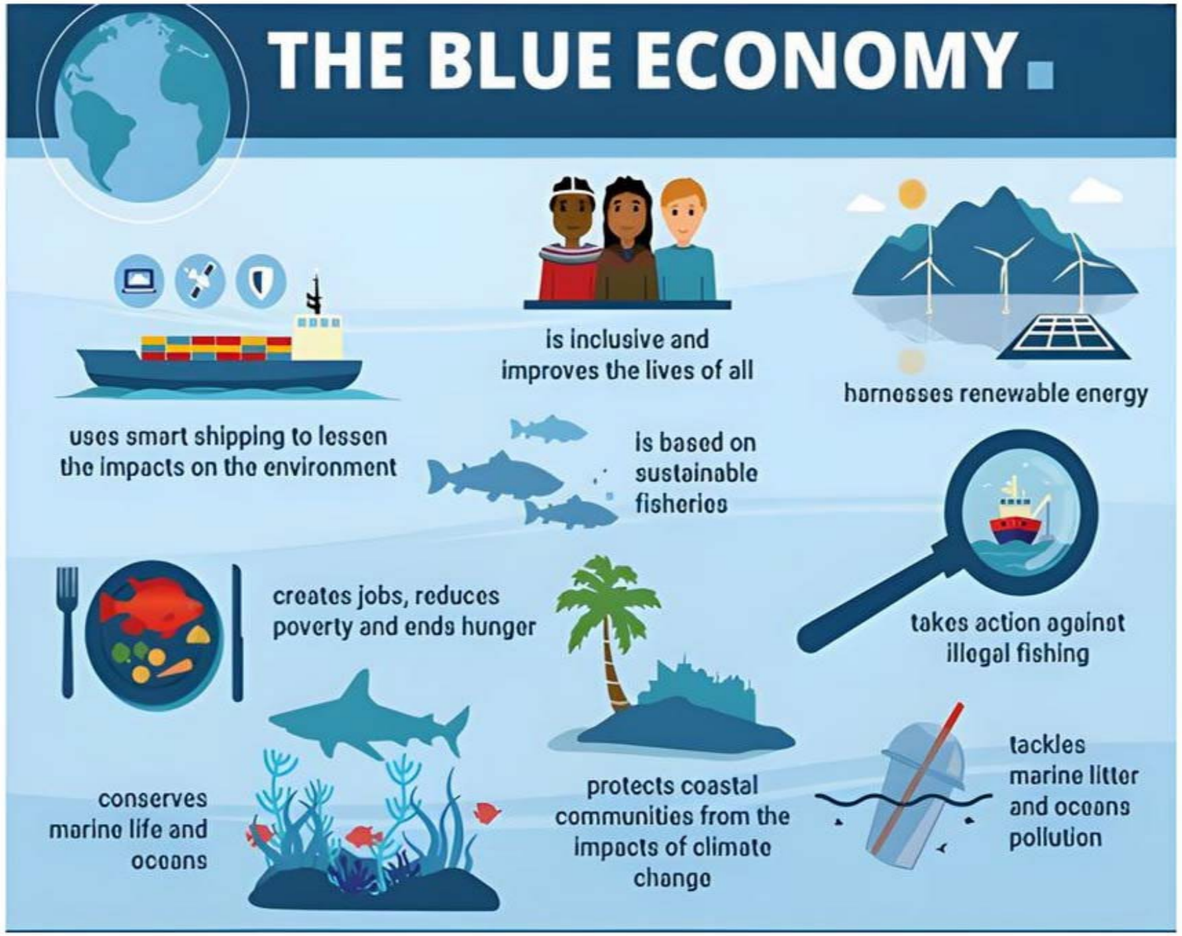
What is the Blue Economy?



Adapted from *Importance of a Sustainable Blue Economy: Statistics and Facts* (Africa News, 2018).

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Definition:
Economic activities associated with the ocean, seas, and coastal regions that enable the sustainable use of marine resources to support economic growth, improve livelihoods and jobs, while preserving the health and resilience of ocean ecosystems (World Bank, 2017)

- Sustainable use of ocean and coastal resources for economic gain
- Maintaining the health of marine ecosystems

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Blue Economy

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- **Renewable Energy**
  Sustainable marine energy, such as tidal and offshore wind, plays a crucial role in driving both social and economic development (Islam & Bartell, 2022).
- **Fisheries**
  Marine fisheries generate over US$270 billion annually in global GDP (Islam & Bartell, 2022). Promoting sustainable fishing practices can boost income, ensure long-term fish supplies, and restore declining fish stocks.
- **Maritime Transport**
  More than 80% of global trade is transported by sea (Islam & Bartell, 2022). By 2050, maritime trade volumes are projected to quadruple, highlighting the importance of sustainable shipping practices(Sea Cargo Charter, 2024).
- **Tourism**
  Coastal and ocean-based tourism is a key source of income and employment, especially in Least Developed Countries (LDCs) and Small Island Developing States (SIDS). (Academy of Malaysia, 2022)
- **Climate Change**
  The ocean is a major carbon sink, helping mitigate climate change impacts such as rising sea levels, acidification, and changing weather patterns. Protecting marine ecosystems strengthens global climate resilience (Islam & Bartell, 2022).
- **Waste Management**
  About 80% of ocean litter comes from land-based sources. Strengthening land-based waste management systems is critical for ocean health and marine life recovery (UNEP, 2019).

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Key Aspects of the Blue Economy

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1. Sustainable Use of Ocean Resources
The Blue Economy focuses on using ocean resources wisely, like fishing in a way that doesn't harm fish populations. It also aims to reduce the environmental damage from activities such as offshore drilling and seabed mining.

2. Conservation of Marine Ecosystems
Protecting the health of ocean ecosystems is a key part of the Blue Economy because they support marine life, help control the climate, and provide for coastal communities. Important efforts include setting up protected ocean areas, fixing damaged habitats, and reducing pollution like plastic and harmful chemicals.

Submerged cage aquaculture of marine fish Photo by NOAA News Archive 090309/NOAA (public domain).

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https://www.finsulate.com/en/blue-economy-non-toxic-eco-friendly-antifouling-innovation/

Key Aspects of the Blue Economy

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3. Economic Development
An important goal of the Blue Economy is to generate sustainable economic growth and employment through ocean-based industries. This includes the promotion of sustainable aquaculture, marine ecotourism, and the development of offshore renewable energy sources like wind and wave power.

4. Climate Change Resilience
Oceans help control the Earth's climate by taking in carbon dioxide and heat. The Blue Economy encourages actions that protect against climate change effects like warmer oceans, rising sea levels, and more acidic water, which can harm marine life and coastal areas.

5. Fostering Marine Innovation and Technology
Advancements technologies are important for helping ocean industries work better and cause less harm to the environment. The Blue Economy supports ideas like clean energy from the sea, eco-friendly fish farming, tools to monitor ocean pollution, and satellite systems to study and manage the ocean.

Offshore Renewable Energy -Photo adapted from Nicholas Doherty (Society Underwater Technology)

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Plastic Pollution

Global Plastic Production

- Global plastic production has surged to **over 400 million tonnes per year**, with cumulative production since the 1950s estimated between **8 and 9 billion tonnes** (OECD, 2022)
- **350 million tonnes of plastic waste is** generated annually, approximately 0.5% (~1.7 million tonnes) enters the **ocean each year from mismanaged waste** (Ritchie, 2023)

Blue Economy Activities That Are Major Sources Of Plastic Pollution

- **Fishing & Aquaculture**: Lost or discarded fishing gear (nets, lines, traps) contributes significantly to marine debris.
- **Marine Tourism**: Coastal tourism generates large volumes of single-use plastics, especially in high-traffic beach areas (Thushari & Senevirathna, 2020).
- **Shipping & Offshore Operations**: Waste from vessels, including packaging and industrial plastics, often ends up in the ocean.
- **Aquaculture Infrastructure**: Plastic cages, ropes, and floats degrade over time, releasing microplastics into the water.
- **Industrial Discharge**: Effluents from coastal industries may carry microplastics and plastic additives into marine systems (Singh et al., 2025).

Photo adapted from The Malaysian Reserve, 2022

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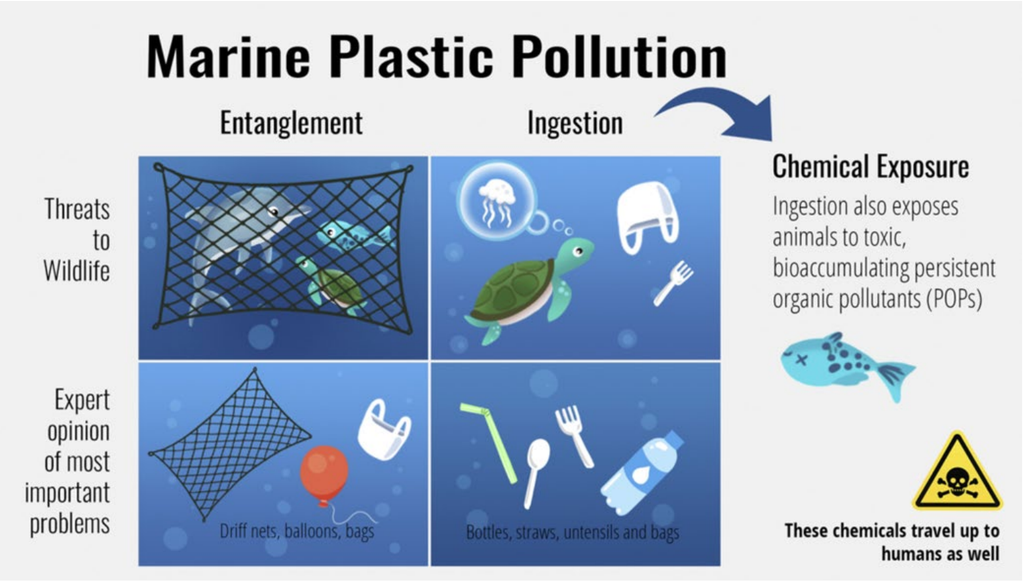
Plastic Pollution



The effects of marine plastic pollution on wildlife (entanglement, ingestion, and chemical exposure) and the top plastic products that cause these problems (Iverson, 2019)

- Marine animals often mistake plastic for food, leading to injury or death.
- As plastics degrade, they fragment into **microplastics**, which enter food chains and even our drinking water.
- The longevity of these materials demands an effort in product design, disposal, and consumption habits.
- At sea, abandoned fishing gear contributes the bulk of plastic waste, with fishing nets constituting 46% of the plastic waste by size in the Pacific subtropical gyre between California and Hawaii. Data from 24 oceanic expeditions suggests that the total amount of ocean plastic pollution was at a minimum of 5.25 trillion pieces, weighing over 250,000 tons.

https://www.whoi.edu/news-insights/content/the-many-lifetimes-of-plastics/

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Overview of Key Challenges

Challenge Area	Description	Examples
Plastic Dependency	Increase in reliance on single-use plastics in fisheries, aquaculture, tourism, and shipping sectors.	Fishing gear, packaging, and tourist consumables often lack alternatives. Transitioning to biodegradable or reusable materials remains economically difficult.
Lack of Awareness & Regulations	Weak enforcement and low public awareness hinder effective plastic management.	Overlapping jurisdictions and the absence of cohesive marine spatial planning led to policy gaps. Public engagement is limited in coastal communities.
Waste Management	Inadequate infrastructure for waste collection, recycling, and treatment in coastal and marine zones.	Coastal tourism and fisheries generate significant waste, but disposal systems are underdeveloped. Marine litter policies are still emerging in many regions.
Data Gap & Traceability	There is limited access to data on plastic flows and their lifecycle impacts across various sectors, which constrains effective analysis and decision-making.	Limited availability of regional-level data hinders effective monitoring and informed policy development. Traceability tools remain underutilized, and a lack of system interoperability presents further challenges.

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Overview of Solutions

Opportunity Area	Practical Solutions
Circular Economy in Blue Industry	- Redesign fishing gear and packaging for recyclability and reuse - Establish shared facilities for waste sorting and material recovery in coastal areas
Blue Innovation & Green Tech	- Launch marine-focused tech hubs to pilot smart fishing nets, water quality sensors, and biodegradable materials - Use satellite and IoT tools to monitor plastic leakage and improve marine logistics - Replace plastic-based gear with PHAs or algae-based alternatives
Sustainable Certifications & Eco Labels	- Encourage seafood businesses to pursue MSC and ASC labels for responsible practices - Promote local and international eco-labels to guide tourist choices - Integrate environmental standards into procurement policies
Public-Private Partnerships (PPP)	- Partner with private firms to upgrade waste infrastructure at ports and beaches - Involve businesses in marine clean-ups and circular economy pilot projects - Co-fund training programs and awareness campaigns for coastal communities

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