SUSTAINABLE DEVELOPMENT GOALS:
EXPLORING MARITIME OPPORTUNITIES
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Authors

DNV GL

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STURLA HENRIKSEN

THE CENTURY OF THE OCEANS

Sometimes, when looking at my little crowd of twins playing in the garden, I get a deeper sense of mission in my own work as a maritime executive. I am encouraged by the potential of the shipping industry to contribute to solving the generational challenge of increasing global living standards, while at the same time reducing environmental degradation. I am intrigued by the prospects for maritime activities to contribute to solving the dilemma of inducing economic growth, while concurrently reducing global warming.

In this report, you will find some of the answers to these challenges. A first of its kind, this report commissioned by the NSA addresses how the shipping industry can contribute to achieving the UN’s Sustainable Development Goals.

Oceans represent our most important global commons. Healthy and productive oceans are essential to the prosperity and well-being of mankind.

The oceans can provide healthy food for billions of people. The ocean floor contains vast amounts of minerals and metals. The deep seas are the frontier of advanced medical research. Offshore oil and gas today supplies a third of the world’s demand for oil and gas. New technology now allows for tapping the enormous potential for renewable, emission-free energy from offshore wind, waves, currents and tidal waters.

A worldwide web of logistics, shipping is carrying 90 per cent of world trade. Already today, shipping is the most energy efficient mode of transportation. Going forward, we will be seeing more green ships traveling the blue oceans. More energy efficient ships is a pre-condition for the world to enjoy sustainable economic growth to the benefit of an increasing world population.

These perspectives offer inspiration and guidance for the demanding restructuring facing many key segments of our maritime industry. They also hold the promise of a host of prosperous opportunities for a better and more sustainable world.

I am convinced that we are standing on the threshold of the “Century of the Oceans.”

Considering these perspectives, I feel a deeper sense of both mission and responsibility in my daily work. And, I feel an optimistic sense of hope and confidence in the future of my little crowd of twins playing in the garden.

Sturla Henriksen
CEO, Norwegian Shipowners’ Association

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In September 2015, world leaders gathered at the United Nations to adopt a roadmap for global development. The 17 Sustainable Development Goals (SDGs) are universal, and they take a holistic approach to development, combining its economic, social and environmental aspects. By working together, we can end poverty and put the planet on a sustainable path - while leaving no one behind.

ERNA SOLBERG

A SEA CHANGE APPROACH TO GLOBAL DEVELOPMENT

In September 2015, world leaders gathered at the United Nations to adopt a roadmap for global development. The 17 Sustainable Development Goals (SDGs) are universal, and they take a holistic approach to development, combining its economic, social and environmental aspects. By working together, we can end poverty and put the planet on a sustainable path - while leaving no one behind.

For decades, we have pursued an integrated ecosystem-based approach to the management of our oceans. For centuries, our oceans, seas and waterways have been the arteries of global trade. They were conduits for the exchange of goods and ideas, and they remain so today. But as we’ve increasingly turned our backs on the oceans for goods and services, we’ve failed to recognize the vital role they can play in shaping the future of our society.

Norway’s prosperity and the welfare of our population. Sustainable use of the oceans laid the foundation for innovation and global cooperation. In the ocean, we face. Many of the challenges are common to all countries, and they require joint global responses. Likewise, the threats to our climate and the health of our oceans can only be addressed through innovation and global cooperation.

Sustainable use of the oceans laid the foundation for Norway’s prosperity and the welfare of our population. For decades, we have pursued an integrated ecosystem-based approach to the management of our oceans. For centuries, our oceans, seas and waterways have been the arteries of global trade. They were conduits for the exchange of goods and ideas, and they remain so today. But as we’ve increasingly turned our backs on the oceans for goods and services, we’ve failed to recognize the vital role they can play in shaping the future of our society.

Norway’s ocean-based industries, and attaches importance to the transfer of expertise and technology across the various industrial sectors. Today, two thirds of the value of Norway’s exports comes from ocean-related activities.

Needless to say, the maritime sector is a major economic player in Norway. Several SDGs are relevant to this sector, not least SDG14. These goals can only be reached through international and multidisciplinary cooperation.

The OECD has predicted that by 2030, ocean-based industries can outperform the growth of the global economy both in terms of value added and employment. My Government therefore has high ambitions for Norway’s ocean-based industries, and attaches importance to the transfer of expertise and technology across the various industrial sectors.

To this end, we recently launched an ambitious strategy for our ocean industries, with a view to paving the way for sustainable growth for years to come. Moreover, my Government will soon launch its first white paper on the role of the oceans in our foreign policy. Key points in the white paper include a firm commitment to the sustainable use of resources, and concrete measures to combat the threats facing our oceans.

And therein lies indeed cause for concern: many sea areas are under threat from pollution, including marine plastic litter and microplastics, and from a loss of biodiversity and the over-harvesting of marine resources. Addressing these issues are at the heart of the 2030 Agenda and the SDGs, and I can assure you that Norway will shoulder its share of the responsibility.

For decades, the competitive advantage of the Norwegian shipping industry has been its high quality services and responsible conduct throughout the value chain. I am pleased to note that the Norwegian Shipowners’ Association remains fully committed to safeguarding this heritage. There are huge challenges facing the shipping industry, but also great opportunities.

This report shows that the Association’s commitment to maintaining the highest possible standards for value creation, remains as firm as ever.

Erna Solberg
Prime Minister of Norway

LISE KINGO

COORDINATE FOR A BETTER WORLD

In 2015, world leaders adopted the 2030 Agenda for Sustainable Development of the United Nations including the 17 Sustainable Development Goals. It sets an ambitious vision for the world that we want, and charts the course for how to get there. Most importantly, it recognizes that global cooperation – within and between sectors, across borders, public with private – is the only way we will get there in time.

As Co-chair of the UN Secretary-General’s group of SDG Advocates, I tend to emphasize that achieving the SDGs at all levels, is the best way we can address the challenges and threats we face. Many of the challenges are common to all countries, and they require joint global responses. Likewise, the threats to our climate and the health of our oceans can only be addressed through innovation and global cooperation.

The Oceans are a global common and a resource for the world to meet the Sustainable Development Goals. It is also a resource we have to treat with care. Counting down to 2030, there will never be a better moment to align your business objectives with creating a better world. I invite the maritime industry to be stewards of our oceans, seas and waterways, creating opportunities down to 2030, there will never be a better moment to align your business objectives with creating a better world.

Throughout the ages, our oceans, seas and waterways have made economic, social and human development possible, serving as conduits for trade and commerce, adventure and discovery. Indeed, life itself arose from the oceans, and life on earth still very much relies on the oceans - from being a prime source of nourishment for billions of people, to impacting our climate and weather, even the air that we breathe, thanks to the delicate interplay between the oceans and the atmosphere.

The Oceans are a global common and a resource for the world to meet the Sustainable Development Goals. It is also a resource we have to treat with care. Counting down to 2030, there will never be a better moment to align your business objectives with creating a better world. I invite the maritime industry to be stewards of our oceans, seas and waterways, creating opportunities for a better world.

Lise Kingo
CEO & Executive Director
United Nations Global Compact
The Sustainable Development Goals (SDGs) are a global call for action to protect the planet, ensure dignified lives for all people, and achieve inclusive economic growth, peace and prosperity. Adopted by the United Nations on 25 September 2015, the 2030 Agenda for Sustainable Development is structured into 17 interconnected and complementary Sustainable Development Goals, including a total of 169 targets. The goals and targets provide global guidance to all governments, enabling the setting of relevant national targets.

However, the SDGs extend beyond the realm of the public sector. They are a call for action to all societal actors, giving particular importance to the role of non-state actors, including business. The SDGs present an extraordinary opportunity for companies to align their strategies and business models with global sustainable development needs. As a global industry, shipping has a critical role to play in meeting many of the goals, and indeed is already contributing to several of the main targets.

This report explores shipping’s potential contributions to the Sustainable Development Goals and identifies five main opportunity areas where the shipping industry can contribute. The report takes how the industry is already contributing to achieving the goals as its point of departure, and looks forward towards emerging opportunities. We examine how shipping can contribute to achieving the SDGs through:

- managing its own operations sustainably;
- influencing and setting requirements for suppliers in the maritime industry;
- enabling other industries in the ocean space to generate economic growth and work, while protecting natural resources for the future.

As a global industry, shipping has a critical role to play in meeting many of the goals.
The shipping industry has the greatest potential to contribute to the goals on climate action, affordable and clean energy, sustainable cities and communities, life below water, good health and well-being, decent work and economic growth, and life on land.

Given the interdependence across all the SDGs, specific contributions related to these goals can also positively contribute to other goals.

We have summarised the potential for the shipping industry to contribute to the SDGs into five main opportunity areas, each with specific examples.

HIGHLIGHTS

1. Act on the Paris Agreement
   - Support strategies for the reduction of GHG emissions from international shipping through the IMO
   - Develop and implement low-carbon solutions on board ships
   - Develop international industry standards to scale up low-carbon solutions on board ships
   - Work with stakeholders in the value chain to enable slow steaming
   - Understand risks and opportunities related to a changing climate and a low-carbon economy
   - Facilitate the transition to an equitable and resilient low-carbon economy

2. Build sustainable communities & infrastructure
   - Develop and implement zero-emission transport concepts in cities and other populated coastal areas
   - Research and develop methods to measure and control particulate matter (PM)
   - Develop transport solutions for moving goods by sea instead of on land
   - Support sustainable energy infrastructure
   - Alleviate pressure from land-based activities
   - Develop and implement solutions for producing and transporting clean drinking water

3. Protect life in the oceans
   - Develop and implement solutions for collecting plastic waste in the oceans
   - Prevent transfer of alien species across geographies
   - Use ships to collect ocean research data
   - Facilitate resource harvesting in the ocean space, including food, minerals and energy
   - Create global governance for resource harvesting in the ocean space

4. Create a sustainable future for the ocean economy
   - Facilitate resource harvesting in the ocean space, including food, minerals and energy
   - Create global governance for resource harvesting in the ocean space
   - Support sustainable energy infrastructure
   - Alleviate pressure from land-based activities
   - Develop and implement solutions for producing and transporting clean drinking water

5. Promote responsible practices
   - Ensure decent work, living wages and responsible practices in the maritime industry
   - Increase transparency and accountability
   - Combat corruption and bribery
   - Support sustainable energy infrastructure
   - Alleviate pressure from land-based activities
   - Develop and implement solutions for producing and transporting clean drinking water

ABOUT THE REPORT

- DNV GL has assisted the Norwegian Shipowners’ Association (NSA) with assessing the potential contributions of the shipping industry to the Sustainable Development Goals.
- The report presents specific examples of how the shipping industry can contribute to the SDGs, but the overview is not exhaustive.
- This report is a first analysis of the opportunities for shipping, and may serve as a foundation for future research to provide more detailed knowledge.
Shipping is an integral part of the global economy. It was one of the first globalizing forces, and has been furthering social and economic interaction for centuries.

Ships transport more than 80% of world trade by volume and are a critical facilitator for most ocean-based industries. Today, the shipping industry influences – both positively and negatively – a wide range of the issues that are addressed by the Sustainable Development Goals (SDGs).
The 17 Sustainable Development Goals present global goals related to the biosphere, society and the economy. As shown in Figure 1, the goals are integrated and inseparable. Society and the economy are embedded within the biosphere. Not only do society and the economy depend on the biosphere, they also shape it at both local and global levels. As we approach the third decade of the 21st century, the environment can no longer be treated as an externality but rather must be treated as essential for human well-being and sustained economic growth.

**ECONOMY**

The primary tasks of shipping are transportation of goods and passengers and facilitation of a range of ocean-based industries such as fishing, aquaculture, offshore oil and gas, offshore wind energy, ocean renewable energy, marine and seabed mining, marine biotechnology and tourism. Shipping is the centre point of the maritime industry, which includes all stakeholders in the value chain such as yards, designers, manufacturers, and service providers. Together, shipping and the maritime industry are a vital part and enabler of other industries in the ocean economy.

The ocean economy contributed around 1.5 trillion USD, or 2.5%, to the global gross value added (GVA) in 2010, providing around 31 million full-time jobs. Most workers are employed within industrial fisheries and tourism. The OECD projects GVA from the ocean economy will grow to more than 3 trillion USD in 2030. The output of the maritime industry in 2030 is estimated at 510 billion USD GVA and 6.5 million full-time jobs. As such, the ocean space will be a significant contributor to the SDGs related to social and economic development.

**SOCIETY**

However, the ocean space is vulnerable and marine resources are limited. Many of these resources are non-renewable and already reaching critical limits. Careful management and governance of marine ecosystems and oceans are needed to use and protect resources sustainably. The shipping industry must manage the difficult balance of providing sustainable yet affordable services, while contributing to governing common resources.

From the perspective of the shipping industry, this report examines how it can contribute to achieving the SDGs through:

- managing its own operations sustainably;
- influencing and setting requirements for suppliers in the maritime industry;
- enabling other industries in the ocean space to generate economic growth and work, while protecting natural resources for the future.

**BIOSPHERE**

FIGURE 2

Opportunities with other industries in the ocean economy

From the perspective of the shipping industry, this report examines how it can contribute to achieving the SDGs through:

- managing its own operations sustainably;
- influencing and setting requirements for suppliers in the maritime industry;
- enabling other industries in the ocean space to generate economic growth and work, while protecting natural resources for the future.
To identify the opportunities for shipping to contribute to the SDGs, we first need to look at the industry’s positive and negative contributions today and the existing regulatory frameworks that aim to reduce future negative impacts.

CURRENT STATUS

To identify the opportunities for shipping to contribute to the SDGs, we first need to look at the industry’s positive and negative contributions today and the existing regulatory frameworks that aim to reduce future negative impacts.

BIOSPHERE

Protecting the biosphere is an essential precondition for social justice and economic development. If we do not achieve the goals related to clean water and sanitation, life below water, life on land, and climate action, the world will fail to achieve the remaining goals.

The shipping industry has a direct impact on the biosphere through emissions to air and discharges to sea. Most scenarios for shipping towards 2050 predict significant growth in the demand for seaborne trade and a corresponding growth in the world fleet.

EXAMPLES

» Shipping is responsible for approximately 3% of total anthropogenic CO2 emissions, or about 900 million tonnes per year. Current regulations address energy efficiency on new ships. The IMO has agreed on a roadmap for developing a GHG reduction strategy.

» Accidental oil spills have been reduced from 300 000 tonnes per year in the 1970s to 5 000 tonnes per year in the period 2010 to 2015.1

» Ships emit around 18 million tonnes NOX (15% of world total) and 10 million tonnes SOX (5–8% of world total) annually.2 New regulations are expected to reduce emissions.

» Shipping is a major contributor to introducing alien species across ecosystems.3 The newly ratified Ballast Water Management Convention will reduce the transfer of species. However, biofouling, which also contributes to the movement of alien species, remains unregulated.

SOCIAL

The next level of the SDGs addresses societal issues and calls for the eradication of poverty, and the improvement of social justice, peace and good health. Social development depends upon a protected biosphere. In addition, the goals on clean energy, no poverty, zero hunger, peace and justice, sustainable cities, education, gender equality, and good health are the foundation for the goals related to the economy.

The shipping industry’s main contribution to achieving the social goals is related to public health and to providing affordable access to global markets for food and other products. Shipping also contributes to increased interaction across cultures, through travel and tourism. But the provision of these services comes at the expense of environmental degradation, which undermines those same societal benefits.

EXAMPLES

» More than 80% of all goods (by volume) are transported by ships, providing access to global markets for food, energy and other products. Shipping is a very efficient mode of transport, with current freight costs calculated to be 7% relative to the value of goods for developed countries and to be 8 to 11% for developing countries.5

» NOX, SOX and PM emissions from ships are a source for pollution in coastal areas and cities. Emissions of particulate matter from shipping are estimated to cause 60 000 cardiopulmonary and lung cancer deaths per year.6

» Shipping is a major transporter of goods, which may include illicit cargo. It operates worldwide and is vulnerable to corruption.

ECONOMY

The final layer of goals relates to economic development. Building on the biosphere and society, the economic goals direct attention towards industry, innovation and infrastructure; reduced inequalities; responsible consumption and production; and decent work and inclusive economic growth that is decoupled from environmental degradation.

For shipping the challenge is twofold: to provide a decent and safe working environment on board ships and throughout its value chain; and to facilitate economic growth through affordable shipping services, but not at the expense of the biosphere.

EXAMPLES

» The economic output of the maritime industry is estimated to 300 billion USD gross value added (GVA) and 5 million full-time jobs. The total output for all ocean industries is around 1 5 trillion USD GVA and 31 million full-time jobs.7

» SOLAS and the Maritime Labour Convention regulate safety and working conditions in international shipping. There are about 6 fatalities per 100 million work hours on board ships per year (excluding fishing), which is ten times the OECD average for all industries.8

» 90% of all ships are recycled, but many ships are still recycled on beaches in developing countries without decent and safe working conditions.
In this chapter, we present the shipping industry’s potential to contribute to each goal, based on the relevant targets identified for shipping and the contribution of the industry today. This mapping provides the basis for the main opportunity areas presented in Chapter C.

IDENTIFYING OPPORTUNITY AREAS

To identify opportunities for the shipping industry to contribute to the SDGs, we have developed a three-step approach.

1. Selection of SDG targets that are relevant for the shipping industry

2. Mapping the potential of the shipping industry to contribute to each goal

3. Identification of five main opportunity areas for shipping to contribute to the SDGs

Each of the 17 SDGs has a series of targets. There are 169 targets in total. Several of these targets have low or no relevance to the shipping industry. We have reviewed all targets for each of the 17 goals and have selected those relevant for the shipping industry. For each goal, we present a summary of the relevant targets.

We have mapped the shipping industry’s potential to contribute to each goal, based on the relevant targets and the contribution shipping is already making today.

Based on the mapping, we present the most business-relevant, effective and significant future opportunities for the shipping industry to contribute to the SDGs - five opportunity areas. Given the interdependence across all the SDGs, we highlight that actions in one area can directly or indirectly contribute to several goals.
BIOSPHERE
SDG 6: Clean water and sanitation

The goal aims to ensure availability and sustainable management of water and sanitation for all.

How can shipping contribute?

- Improve water quality by reducing pollution, eliminating dumping, and minimizing the release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally (Target 6.3)
- Substantially increase water-use efficiency and ensure sustainable withdrawals and supply of freshwater. Expand international cooperation and capacity-building support to developing countries in water and sanitation-related activities, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies (Targets 6.4, 6.5)

Effect of contribution

<table>
<thead>
<tr>
<th>TYPE OF EFFECT</th>
<th>MAGNITUDE OF EFFECT</th>
</tr>
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<tbody>
<tr>
<td>Moderately direct: Shipping can directly influence the use of chemicals and water in its own operations, and is also able to influence the design, construction and scrapping of ships.</td>
<td>Low effect: Chemicals emitted from ships have a limited impact on clean water. Further, the technology and know-how regarding sanitation are not specific to shipping.</td>
</tr>
</tbody>
</table>

SDG 13: Climate action

The goal calls for urgent action to combat climate change and its impacts. It acknowledges the UNFCCC as the main international intergovernmental forum for negotiating the global response to climate change. Shipping emissions are currently not included under the UNFCCC negotiations. However, the IMO has been tasked with developing measures to reduce GHG emissions from international shipping.

How can shipping contribute?

- Promote understanding and create awareness in the maritime industry of possible climate risks (physical, policy and legal, technology, market and reputation-related) and their financial impacts in the shipping value chain.
- Reduce GHG emissions from its own operations, for example through use of alternative fuels, increased energy efficiency and improved logistics.
- Enhance adaptive capacity to enable sectors in the shipping value chain to adapt and respond to climate change and related risks.
- Set requirements for suppliers within ship design and construction for low- or zero-carbon ships and for improving the carbon footprint of shipbuilding.
- Develop shipping-specific global GHG reduction policies and mechanisms through the IMO and collaborative industry initiatives. Shipping policies should be linked to cross-sectoral efforts.
- Contribute to GHG emission reductions in other transport sectors by transferring transport work from road to sea.
- Assess and disclose climate-related risks based on the recommendations from the Financial Stability Board’s (FSB) Task Force on Climate-related Financial Disclosures.

Effect of contribution

<table>
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<tr>
<th>TYPE OF EFFECT</th>
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<tbody>
<tr>
<td>Very direct: Shipping can directly influence GHG emissions in its own operations, and has a dedicated international organization (IMO) for developing international policies and regulations.</td>
<td>High effect: The shipping industry emits 2.3% of global GHG emissions and needs to contribute its share of reduction efforts. Shipping can also contribute to emission reductions in other sectors.</td>
</tr>
</tbody>
</table>
**SDG 14: Life below water**

The goal aims to conserve and sustainably use the oceans, seas and marine resources for sustainable development.

### How can shipping contribute?

- **Prevent and significantly reduce marine pollution, sustainably manage and protect marine and coastal ecosystems and minimize and address the impacts of ocean acidification (Targets 14.1, 14.2, 14.3)**
  - Use maritime regulatory institutions to effectively implement policies and to foster innovation.
  - Use maritime regulatory institutions to effectively implement policies and to foster innovation.
  - Continue to reduce emissions to air from its own operations, such as NOX, SOX, and CO2. Reduced emissions will lower the contribution to acidification and eutrophication.
  - Improve its own operations through management and treatment of ballast water.
  - Continue to reduce discharges to sea from its own operations, such as ballast water, chemicals, waste, oil and sewage.
  - Ensure the conservation, restoration and sustainable use of terrestrial ecosystems, and inland freshwater ecosystems and their services.
  - Set requirements for suppliers within ship design, construction and scrapping.
  - Ensure the conservation, restoration and sustainable use of terrestrial ecosystems, and inland freshwater ecosystems and their services.
  - Introduce regulations on biofouling to prevent transfer of alien species.

### Effect of contribution

**TYPE OF EFFECT**

- Very direct: Shipping can directly influence the transport and discharge of invasive alien species through modern ballast water management systems.

**MAGNITUDE OF EFFECT**

- Medium effect: Invasive alien species is an important aspect of the goal. Food and energy production in the oceans will alleviate pressure on terrestrial ecosystems.
SOCIETY

ECONOMY

BIOSPHERE

SOCIETY
**SDG 1: No poverty**

The goal aims to end poverty in all its forms everywhere.

**How can shipping contribute?**

- Provide affordable and sustainable transportation of goods and people.
- Provide affordable access to markets.
- Provide access to basic goods for vulnerable groups to build resilience and in cases of emergencies.
- Create jobs both within its own operations and within ship design, construction and scrapping.
- Facilitate job creation and growth within the ocean economy.
- Contribute to affordable energy and access to food through facilitating energy and food production in the ocean space.

**Effect of contribution**

- **TYPE OF EFFECT**
  - Indirect: Through facilitating trade, access to goods and efficient functioning of markets.
  - Medium effect: The shipping industry is a critical facilitator of activities within the ocean space and provides access to markets.
- **MAGNITUDE OF EFFECT**
  - 

**SDG 2: Zero hunger**

The goal aims to end hunger, achieve food security, improve nutrition, and promote sustainable agriculture.

**How can shipping contribute?**

- Facilitate harvesting and production of sustainable food from the ocean space by supporting installation and operation of production assets.
- Provide affordable and sustainable transportation of food.
- Provide access to food markets and thereby reduce food price volatility.
- Provide access to food for vulnerable groups to build resilience, and provide assistance in cases of emergencies.
- Facilitate job creation and growth within the ocean economy.
- Contribute to affordable energy and access to food through facilitating energy and food commodities markets, facilitate timely access to market information and limit extreme food price volatility (Targets 2.1, 2.c).

**Effect of contribution**

- **TYPE OF EFFECT**
  - Moderately direct: Through facilitating trade, production of and access to food, and efficient functioning of food commodity markets.
  - Medium effect: The shipping industry is a critical facilitator of activities within the ocean space and provides access to markets.
SDG 3: Good health and well-being
The goal aims to ensure healthy lives and promote well-being for all at all ages.

How can shipping contribute?

- Support its own employees who experience substance abuse.
- Provide alternative, maritime transport services to reduce road transport, thereby reducing traffic accidents.
- Continue to reduce discharges to sea from its own operations, such as chemicals, oil, sewage and grey water.
- Continue to reduce emissions from air from its own operations, such as NOx, SOx and PM.
- Continue to reduce the use of hazardous chemicals in its own operations.
- Set requirements for suppliers within ship design, construction and scrapping with regard to chemical use, and emissions to air, water and soil.
- Use maritime regulatory institutions to effectively implement policies.

Effect of contribution

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<tr>
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<tbody>
<tr>
<td>Very direct: Shipping can directly influence the emissions to air and sea from its own operations, and is also positioned to influence the design, construction and scrapping of ships.</td>
<td>3</td>
</tr>
<tr>
<td>Medium effect: Shipping emissions are significant, but only one of many sources of emissions to air and discharges to sea. However, shipping has a limited impact on global substance abuse and traffic accidents.</td>
<td>2</td>
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SDG 4: Quality education
The goal aims to ensure inclusive and equitable quality education and to promote lifelong learning opportunities for all.

How can shipping contribute?

- Develop global standards for skills and education to help accelerate education and training globally in the sector.
- Continue to provide vocational education, training and traineeships in its own operations.
- Continue to support maritime academies to ensure a skilled future workforce.

Effect of contribution

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<tr>
<td>Moderately direct: Shipping can provide vocational education and training within its own operations, and by supporting maritime academies and global maritime educational standards.</td>
<td>3</td>
</tr>
<tr>
<td>Low effect: Shipping employs only around 1 million persons.</td>
<td>1</td>
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</table>
SDG 5: Gender equality
The goal aims to achieve gender equality and empower all women and girls.

How can shipping contribute?
- Improve gender equality in its own operations.
- Targeted recruitment and mentoring of women in leadership positions.

Effect of contribution

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RELEVANT TARGETS FOR SHIPPING
End all forms of discrimination against women and ensure women’s full and effective participation and equal opportunities for leadership at all levels of decision making (Targets 5.1, 5.2)

SDG 7: Affordable and clean energy
The goal aims to ensure access to affordable, reliable, sustainable and modern energy for all.

How can shipping contribute?
- Provide shipping services for distributing renewable energy - dependent on the type of energy and location of production.
- Provide shipping services and technology related to harvesting offshore energy, for example solar, tidal, wind, wave and biomass energy.
- Improve energy efficiency of all parts of its own operations.
- Continue to develop and implement zero-emission solutions.

Ensure universal access to affordable, reliable and modern energy services, increase the share of renewable energy and double the rate of improvement in energy efficiency (Targets 7.1, 7.2, 7.3)

Effect of contribution

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<tbody>
<tr>
<td>Very direct</td>
<td>High effect</td>
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RELEVANT TARGETS FOR SHIPPING
- Increase the use of renewable energy solutions in its own operations, such as biofuels, hydrogen, solar and wind.
- Improve energy efficiency of all parts of its own operations.
- Provide shipping services for harvesting offshore energy, for example solar, tidal, wind, wave and biomass energy.

The goal aims to ensure access to affordable, reliable, sustainable and modern energy for all.

Ensure universal access to affordable, reliable and modern energy services, increase the share of renewable energy and double the rate of improvement in energy efficiency (Targets 7.1, 7.2, 7.3)
SDG 11: Sustainable cities and communities

The goal aims to make cities and human settlements inclusive, safe, resilient and sustainable.

How can shipping contribute?

- Provide access to safe and sustainable transport systems for all and reduce adverse environmental impacts of cities, including adverse impacts on air quality (Targets 11.2, 11.6)

RELEVANT TARGETS FOR SHIPPING

- SDG 11: Sustainable cities and communities
  - Provide access to safe and sustainable transport systems for all and reduce adverse environmental impacts of cities, including adverse impacts on air quality (Targets 11.2, 11.6)

Effect of contribution

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<thead>
<tr>
<th>TYPE OF EFFECT</th>
<th>MAGNITUDE OF EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very direct: Shipping can provide low-emission transport services in cities.</td>
<td>🌟🌟🌟🌟🌟</td>
</tr>
<tr>
<td>Medium effect: Sea-based transportation is not possible for all cities, and ships will be able to substitute only parts of traffic on land. Still, the emission reductions can be significant.</td>
<td>🌟🌟🌟🌟</td>
</tr>
</tbody>
</table>

SDG 16: Peace, justice and strong institutions

The goal aims to promote peaceful and inclusive societies, to provide access to justice for all and to build effective, accountable and inclusive institutions at all levels.

How can shipping contribute?

- Increase transparency on cargoes, destinations, financial transactions and on the use of agents and intermediaries.
- Reduce corruption and bribery through effective compliance systems and proper training.
- Implement mechanisms for internal reporting and safeguards for whistle-blowers.

RELEVANT TARGETS FOR SHIPPING

- SDG 16: Peace, justice and strong institutions
  - Significantly reduce illicit financial and arms flows, and combat all forms of organized crime (Target 16.4)
  - Substantially reduce corruption and bribery (Target 16.5)
  - Develop effective, accountable and transparent institutions at all levels (Target 16.6)

Effect of contribution

<table>
<thead>
<tr>
<th>TYPE OF EFFECT</th>
<th>MAGNITUDE OF EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium effect: There are limits to what the shipping industry can do beyond its own operations, but the effects of reducing illicit arms flows and corruption are significant.</td>
<td>🌟🌟🌟🌟🌟</td>
</tr>
<tr>
<td>Moderately direct: Shipping is a major transporter of goods, which may include illicit cargo. It operates worldwide and is exposed to and can react to corruption.</td>
<td>🌟🌟🌟🌟</td>
</tr>
</tbody>
</table>

Effect of contribution

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<td>🌟🌟🌟🌟</td>
</tr>
</tbody>
</table>

How can shipping contribute?

- Promote and use shore-based electricity when in port to reduce emissions.
- Continue to develop and implement zero-emission solutions for urban transport.
ECONOMY
**SDG 8: Decent work and economic growth**

The goal aims to promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

**How can shipping contribute?**

- Provide affordable and sustainable shipping services facilitating economic growth and job creation across industries.
- Continue to use maritime regulatory institutions to develop and implement common safety regulations.
- Provide access to training and development in all segments.
- Provide sustainable cruises to support sustainable tourism.

**Effect of contribution**

<table>
<thead>
<tr>
<th>TYPE OF EFFECT</th>
<th>MAGNITUDE OF EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Moderately direct:</strong> Shipping can directly influence employment conditions in its own operations and for direct suppliers, and can facilitate growth in the ocean economy.</td>
<td><strong>High effect:</strong> The shipping industry is a critical facilitator of activities within the ocean space and provides access to markets. It also has potential to improve working conditions and labour rights within its own operations and in the supply chain.</td>
</tr>
</tbody>
</table>

**SDG 9: Industry, innovation and infrastructure**

The goal aims to build resilient infrastructure, to promote inclusive and sustainable industrialization and to foster innovation.

**How can shipping contribute?**

- Retrofit and upgrade its own vessels with new, environmentally friendly technologies.
- Improve shipping services in geographical areas where there is a further need for affordable and equitable access to shipping services.
- Enhance adaptive capacity, to enable stakeholders in the shipping value chain to adapt and respond to climate change and related risks.
- Increase spending on R&D in the ocean space and in related industries and join public and/or private partnerships to develop infrastructure to support sustainable resource exploitation.

**Effect of contribution**

<table>
<thead>
<tr>
<th>TYPE OF EFFECT</th>
<th>MAGNITUDE OF EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Moderately direct:</strong> Shipping is a part of the international trade infrastructure and can contribute to developing a resilient transport infrastructure.</td>
<td><strong>Low effect:</strong> Shipping already has an extensive network and infrastructure and there is a limited impact from shipping on other types of industries and infrastructure.</td>
</tr>
</tbody>
</table>

**RELEVANT TARGETS FOR SHIPPING**

- Achieve higher levels of economic productivity, improve global resource efficiency and decouple economic growth from environmental degradation (Targets 8.2, 8.4)
- Achieve full and productive employment and decent work, eradicate forced labour, modern slavery, human trafficking and child labour, protect labour rights and promote safe working environments (Targets 8.5, 8.7, 8.8)
- Promote sustainable tourism (Target 8.9)
**SDG 10: Reduced inequalities**
The goal aims to reduce inequality within and among countries.

**How can shipping contribute?**
- Ensure diversity and living wages within its own operations and for suppliers.
- Ensure that all sea transport is orderly and safe.
- Work with governments to enhance search and rescue activities in relevant areas.

**Effect of contribution**

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Indirect: Shipping has limited direct impact on inequality within and among countries. Coastal states are responsible for organizing search and rescue activities.</td>
<td>Low effect: There is a limited impact from shipping beyond its own operations.</td>
</tr>
</tbody>
</table>

**SDG 12: Responsible consumption and production**
The goal aims to ensure sustainable consumption and production patterns.

**How can shipping contribute?**
- Facilitate harvesting and production of sustainable food from the ocean space.
- Continue to reduce waste generation, including food waste, from its own operations.
- Prevent food losses in the value chain by providing efficient and reliable transportation of food.
- Continue to improve management of the use of chemicals in its own operations.
- Continue to reduce discharges of chemicals from its own operations.
- Implement reporting on sustainability performance based on recognized standards such as the Global Reporting Initiative (GRI) or the International Integrated Reporting Framework.

**Effect of contribution**

<table>
<thead>
<tr>
<th>TYPE OF EFFECT</th>
<th>MAGNITUDE OF EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderately direct: Shipping can directly influence waste generation and use of chemicals, and can also facilitate sustainable food production.</td>
<td>Low effect: There is a limited impact from shipping beyond its own operations.</td>
</tr>
<tr>
<td>Medium effect: Shipping is mainly a facilitator of activities related to food within the ocean space.</td>
<td>Low effect: There is a limited impact from shipping beyond its own operations.</td>
</tr>
</tbody>
</table>
SDG 17: Partnerships for the goals

The goal aims to revitalize the global partnership for sustainable development.

How can shipping contribute?

- Participate in partnerships with industry, NGOs and public bodies to promote sustainable practices, technology transfer and experience sharing.
- Develop shipping-specific sustainability policies and mechanisms through the IMO and industry-specific collaborative initiatives.
- Contribute in making international governance of the ocean space more effective, and in improving coordination with other international bodies.

Effect of contribution

**TYPE OF EFFECT**

- Moderately direct: Shipping can be an important contributor in partnerships, and has a dedicated international organization (IMO) for developing international policies and regulations.
- Medium effect: Shipping is a global industry operating in both developed and developing countries, and can create powerful partnerships across national and regional boundaries.

**MAGNITUDE OF EFFECT**

- Medium effect: The magnitude of effect will depend on the current impact of shipping and whether additional actions will have a significant effect.

Summary:
The potential for shipping to contribute to each goal based on the relevant targets and the status today

**MAGNITUDE OF EFFECT** refers to the size of effect on the relevant targets. The magnitude of effect will depend on the current impact of shipping and whether additional actions will have a significant effect.

**TYPE OF EFFECT** refers to whether the shipping industry has a direct vs. indirect effect on the relevant SDG targets. Indirect effects refer to situations where shipping influences other activities necessary for the achievement of the SDGs, such as providing market access and distributing food.

Summary of the potential for shipping to contribute to each goal based on the relevant targets and the status today

**FIGURE 3**

Summary:
The potential for shipping to contribute to each goal based on the relevant targets and the status today

**MAGNITUDE OF EFFECT** refers to the size of effect on the relevant targets. The magnitude of effect will depend on the current impact of shipping and whether additional actions will have a significant effect.

**TYPE OF EFFECT** refers to whether the shipping industry has a direct vs. indirect effect on the relevant SDG targets. Indirect effects refer to situations where shipping influences other activities necessary for the achievement of the SDGs, such as providing market access and distributing food.
The SDGs present an extraordinary opportunity for businesses to align their strategies and business models with global sustainable development needs. Critically, many of the goals are unlikely to be met without significant private sector investment in technology development and innovation.

Here we present five main opportunity areas for the shipping industry to contribute to the SDGs. These contributions cut across the three types of SDGs: related to the biosphere, society and the economy.

The shipping industry has the greatest potential to contribute to the goals on climate action, affordable and clean energy, sustainable cities and communities, life below water, good health and well-being, decent work and economic growth, and life on land. Opportunities related to these goals can also positively contribute to other goals.
Shipping introduced the first global CO₂ regulation with Chapter 4 in MARPOL Annex VI in 2011. However, with an estimated annual emission of 900 million tonnes CO₂ from international shipping, the industry will need to do more to reach the ambitious commitments in the Paris Agreement.

Shipping emissions are currently not included under the UNFCCC negotiations. Global GHG reduction policies and mechanisms for shipping should be developed through the IMO and industry-specific collaborative initiatives. Shipping policies should be linked to cross-sectorial efforts. For example, shifting the transport of cargo from road to sea will increase shipping emissions, but will reduce overall emissions.

Shipping can contribute directly through increased energy efficiency and implementing low-carbon solutions. Indirectly, moving goods by sea instead of by land can reduce total emissions.

Support strategies for the reduction of GHG emissions from international shipping through the IMO

Shipping is an international industry; therefore, regional emission regulations alone will be insufficient. One option could be to introduce an international levy on CO₂ emissions, or to enforce a speed limit for ships.

Develop and implement low-carbon solutions on board ships

New technologies and solutions within energy efficiency, logistics and alternative fuels can significantly reduce GHG emissions from ships.

Facilitate the transition to an equitable and resilient low-carbon economy

In addition to actions related to its own operations, shipping can contribute to enhancing resilience and meeting adaptation goals. It can also contribute to reducing emissions from other industries. For example, the maritime industry is a critical facilitator of offshore renewable energy production and production of lower-carbon foods from the aquaculture industry. In addition, moving goods by sea instead of by land can reduce total emissions from transportation.

Understand risks and opportunities related to a changing climate and a low-carbon economy

Assess and disclose climate-related risks and opportunities based on the recommendations from the Financial Stability Board’s (FSB) Task Force on Climate-related Financial Disclosures.

Develop international industry standards to scale up low-carbon solutions

Global standards developed by the industry will enable scaling up of solutions. Examples of standards include those involving the use of electricity and shore connections for charging batteries and cold ironing.

Support the development of financial incentives to install low-carbon solutions on board ships

Examples of incentives are low-emission requirements in public procurement projects, direct public support and a support fund such as the Norwegian NOX fund.

Work with stakeholders in the value chain to enable slow steaming

Slow steaming is the most effective energy efficiency measure, and slowing down ships can significantly reduce energy use and emissions. However, to implement slow steaming would require acceptance that sea transport would be slower.

Research and develop methods to measure and control black carbon

Black carbon contributes to climate change; therefore, emissions should be controlled and reduced.
Develop and implement zero-emission transport concepts in cities and other populated coastal areas

Local emissions of SOx, NOx and PM are a major health problem, but solutions exist to develop zero-emission ships and transport systems, such as ferries running on batteries.

Research and develop methods to measure and control particulate matter

PM has a serious negative impact on public health in coastal areas and cities, but is largely unregulated.

Develop and implement solutions for moving goods by sea instead of on land

Sea transport is the most efficient mode of transportation, but short-distance sea transport is less flexible than land transport. Shipping solutions must overcome this disadvantage to become competitive over shorter distances. Overcoming this disadvantage will require cooperation across sectors and between actors in the value chain. Sea transport can boost economic growth, laying foundations for societal benefits in countries with poor land transport infrastructure.

Support sustainable energy infrastructure

Shipping can develop effective solutions for installation and operation of offshore solar, wind, biomass, tidal and other renewable energy production assets.

Alleviate pressure from land-based activities

Road transport, agriculture and energy production on land are major sources of local emissions and noise, and require vast land areas. By moving transportation and production of food and energy to the oceans, pressure on communities and ecosystems on land can be reduced.

Shipping already provides a global infrastructure for the movement of goods and people, connecting and supporting communities worldwide. Going forward, shipping can develop and implement a series of solutions to build sustainable communities and infrastructure.

The main challenge for shipping will be to provide affordable shipping services, while reducing the impact from its own operations on the environment and on public health. Regulatory control of emissions to air currently addresses NOx, SOx and CO2, but additional efforts are needed. In the shorter term, this entails a global sulphur limit and phase-in of NOx Tier II/III-compliant engines. Regulatory control of particles and black carbon and further regulation of CO2 emissions are also needed.  

With population growth and increasing urbanization, the need for efficient and environmentally friendly infrastructure will increase. Shipping can play a critical role in the transition towards more sustainable communities and infrastructure. The shipping industry can offer low-emission alternatives to land-based transport of goods and passengers, and can also alleviate pressure on land-based resources, by moving some production of food, water and energy offshore.
Develop and implement solutions for collecting plastic waste in the oceans

Plastic waste has a serious negative impact on life in the oceans and harms the livelihoods of many communities. Plastic also transports alien species across oceans. Shipping can provide solutions for clean-up activities in the ocean space, for example through the collection of microplastic.

Prevent transfer of alien species across geographies

Shipping can contribute by implementing the recently ratified Ballast Water Management Convention and by developing new solutions and regulations for biofouling. The introduction of alien species has serious consequences for ecosystems and local economies.

Use ships to collect research data on the oceans

Using digital technologies and sensors, ships can collect and share data with the international research community. Such collection and sharing will increase understanding of the ocean space, of acidification, and of marine ecosystems.

Since 1977, shipping has significantly reduced accidental and operational discharges to sea and increased its control of hazardous chemicals. The main drivers have been stricter regulations through the MARPOL Convention, the IBC (International Bulk Chemical) Code and the IMDG (International Maritime Dangerous Goods) Code. The IMO also allows for the introduction of special measures in Particularly Sensitive Sea Areas (PSSAs).

Moving forward, the most significant contribution toward the SDGs will be to reduce the transfer of alien species through ballast water, as per the Ballast Water Management Convention. Better understanding of the impact shipping has on wildlife will help identify appropriate measures for the co-existence of marine life and economic activities in the ocean space.

Shipping can also contribute by cleaning up ocean plastic waste and providing researchers and decision makers with information on the state of the oceans.

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Shipping can also contribute by cleaning up ocean plastic waste and providing researchers and decision makers with information on the state of the oceans.
Create a sustainable future for the ocean economy

The OECD estimates that ocean-based industries contributed 1.5 trillion USD, or 2.5%, to the global gross value added (GVA) in 2010, providing around 31 million full-time jobs. Most workers are employed within industrial fisheries and tourism. The OECD projects GVA to grow to more than 3 trillion USD in 2030 in a business-as-usual scenario.

Shipping has a critical role in facilitating harvesting of resources in the ocean space such as food, energy and raw materials, as well as facilitating economic growth and job creation. The exploitation of ocean resources must be sustainable and managed through global frameworks.

Facilitate resource harvesting in the ocean space

The ocean space contains vast resources that can be used to produce food and medicines, and to harvest energy and minerals.

For example:
- organisms with different enzymes and components can be used in biotechnology and production of medicines;
- wind and waves can be exploited to harvest energy;
- food production in the oceans will increase access to food while reducing the impact from agriculture on land.

Shipping services will be essential for harvesting and transporting these resources. For example, shipping competence, especially from the offshore oil and gas industry, can be used to develop and maintain production assets related to offshore mining and energy production.

Support the creation of global governance institutions for resource harvesting in the ocean space

The ocean is a vulnerable space and resources are limited. Careful ecosystem-based management allowing for sustainable resource harvesting in the ocean space is needed to use the resources sustainably. Shipping is well governed through the IMO, and the institution’s processes can be used as a template for other organisations that regulate activities in the ocean space.
The shipping industry has well-established frameworks for safety and working conditions through SOLAS and the Maritime Labour Convention. However, the fatality rates on board ships are about ten times higher than the OECD average for all industries. The industry needs to focus on implementing and continuously improving regulatory frameworks and requirements.

While there are 1 million people employed in shipping, 5 million people are employed in the wider maritime industry. Because shipping is a major purchaser of services from the wider industry, it has a significant opportunity to influence and set requirements in the supply chain. Many ships are still built in yards where safety and workers’ rights are not respected, or are recycled on beaches in developing countries without decent working conditions.

The shipping industry is also vulnerable to corruption. Bribery is estimated at 1 trillion USD annually by the World Bank, and is a major obstacle to democracy, rule of law and equitable development. Private sector corruption alone in developing countries is estimated at 500 billion each year. Corruption raises the cost of doing business, thereby hindering growth, investment and job creation.

Ensure decent work, living wages and responsible practices in the maritime industry

Continue to improve labour rights, working conditions and safety practices in its own operations by:

- implementing the eight fundamental ILO conventions, SOLAS and other relevant conventions;
- setting requirements for suppliers within ship design, construction and recycling.

Increase transparency and accountability

Increase transparency on cargoes, destinations, financial transactions and the use of agents and intermediaries. Strengthen global and national maritime regulatory institutions to reduce opportunities for corruption, bribery and illicit cargo flows.

Combat corruption and bribery

through effective compliance systems, proper training, mechanisms for internal reporting and safeguards for whistle-blowers.
When evaluating the opportunities for shipping to contribute to the SDGs, we have looked at:

- core shipping activities such as goods and passenger transportation;
- direct service suppliers in the maritime industry, in particular ship construction, maintenance and scrapping (listed as “Supplier” in Table 1); and
- industries where shipping and the maritime industry are essential service providers (listed as “Facilitator” in Table 1).

The evaluation takes the current situation as a starting point and looks only at additional contributions and opportunities for shipping as part of the maritime industry and the ocean economy. It does not include assumptions regarding what would happen if shipping services would cease to exist.

The maritime industry includes all stakeholders in the shipping value chain such as shipping companies, yards, designers, manufacturers, and service providers. To contribute to the SDGs, shipping needs to take responsibility for its direct impact from its own operations, as well as influencing its suppliers, where possible. In addition, it needs to facilitate sustainable activities in the wider ocean space.

Table 1 lists the established and emerging industries defined by the OECD as part of the ocean economy, and how these industries relate to shipping in the scope of this study.

### Table 1: Industries in the Ocean Economy

**Established Industries**

<table>
<thead>
<tr>
<th>Industry</th>
<th>Relation to Shipping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capture fisheries</td>
<td>Facilitator</td>
</tr>
<tr>
<td>Seafood processing</td>
<td>Facilitator</td>
</tr>
<tr>
<td>Ports</td>
<td>Infrastructure</td>
</tr>
<tr>
<td>Offshore oil and gas</td>
<td>Supplier</td>
</tr>
<tr>
<td>Marine manufacturing</td>
<td>Supplier</td>
</tr>
<tr>
<td>Maritime and coastal</td>
<td>Supplier</td>
</tr>
<tr>
<td>Marine business services</td>
<td>Supplier</td>
</tr>
<tr>
<td>Marine R&amp;D and education</td>
<td>R&amp;D</td>
</tr>
<tr>
<td>Dredging</td>
<td>Infrastructure</td>
</tr>
</tbody>
</table>

**Emerging Industries**

<table>
<thead>
<tr>
<th>Industry</th>
<th>Relation to Shipping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marine aquaculture</td>
<td>Facilitator</td>
</tr>
<tr>
<td>Deep and ultra-deep water oil and gas</td>
<td>Facilitator</td>
</tr>
<tr>
<td>Offshore wind energy</td>
<td>Facilitator</td>
</tr>
<tr>
<td>Ocean renewable energy</td>
<td>Facilitator</td>
</tr>
<tr>
<td>Marine and seabed mining</td>
<td>Facilitator</td>
</tr>
<tr>
<td>Maritime safety and surveillance</td>
<td>Infrastructure</td>
</tr>
<tr>
<td>Marine biotechnology</td>
<td>Facilitator</td>
</tr>
<tr>
<td>High-tech marine products and services</td>
<td>R&amp;D</td>
</tr>
<tr>
<td>Others</td>
<td>Facilitator</td>
</tr>
</tbody>
</table>

The evaluation takes the current situation as a starting point and looks only at additional contributions and opportunities for shipping as part of the maritime industry and the ocean economy. It does not include assumptions regarding what would happen if shipping services would cease to exist.

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- industries where shipping and the maritime industry are essential service providers (listed as “Facilitator” in Table 1):
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