Environment at a Glance Indicators

Sustainable ocean economy

Context

Issues at stake

The ocean may be a new economic frontier (OECD, 2016) but foremost it is a shared global resource. Ocean-related industries in many countries have expanded with insufficient consideration for the environment, risking the natural resources and essential marine ecosystem services on which economies and the well-being of people depend.

The **health of marine ecosystems** is a key issue. Marine biodiversity sustains life in the ocean and life on land; marine biodiversity, composed of species, ecosystems and genetic diversity, provides critical ecosystem services like food and oxygen production and carbon sequestration. Biodiversity loss reduces the ability of marine ecosystems to provide these services and their capacity to recover from climatic or biogeochemical changes (Worm et al., 2006). The most important pressures on marine biodiversity are resource over-exploitation, pollution, habitat disturbance, climate change and invasive alien species (Halpern et al., 2017; OECD 2017a).

Closely linked is the **well-being of people and the resilience of coastal communities to risks**. Sea level rise, extreme weather events, over-extraction of marine resources, over-tourism, and air and water pollution from ocean industries and land-based sources can threaten the health, infrastructure and livelihoods of coastal populations.

It is also necessary to monitor progress in improving the **environmental and resource productivity** of the ocean economy; that is, are we becoming more efficient in using ocean resources? What are the key dependencies of our economies on ocean resource utilisation?

We need to better understand how households, industries and governments are responding to these challenges. For example, achieving environmental objectives cost-efficiently will require considerable innovation, a key driver of productivity gains and

economic growth that may create new business opportunities and markets. Monitoring and highlighting **economic opportunities** like those created through innovation and investment directed at ocean sustainability can help motivate and accelerate the necessary changes.

How are policy-makers responding to these challenges? **Policy responses** take many different forms (in part because pressures on ocean ecosystems vary locally and regionally). For example, the designation of marine protected areas can help conserve and restore habitats and species and ensure that marine and coastal ecosystems continue to provide storm and erosion protection, carbon storage, fisheries, recreation and tourism opportunities, and other services.

Taxes, subsidies and other policy instruments provide important market signals that can profoundly influence the behaviour of producers and consumers. They help incorporate environmental costs and benefits into the decisions of households and businesses, by changing the price of a product or service. They can be cost-effective way to achieve environmental goals, such as limiting air emissions from maritime shipping, reducing discharges of contaminated water from vessels, encouraging sustainable management of marine resources, and reducing noise from transport and energy installations that can harm marine ecosystems.

Some government measures such as those supporting offshore oil & gas extraction or those supporting consumption of fossil fuels in marine transport and fisheries, may be particularly harmful for the marine environment and economically wasteful. Such measures often undermine climate and biodiversity policy goals and increase the overall cost of the necessary transition.

Policy challenges

- Ensure the effective conservation and sustainable use of marine biodiversity, for example, by strengthening the degree of protection of species, habitats and ecosystems, sustainably managing fish stocks, reducing illegal and unregulated fishing and other resource extraction, implementing ambitious biodiversity and climate-related policies and reforming environmentally harmful subsidies. See the *Environment at a Glance: Biodiversity chapter* for more information.
- Strengthen international and regional co-operation to protect the marine environment (e.g. pursue the ratification and implementation of international agreements on the prevention of marine pollution such as the 1996 Protocol to the London Dumping Convention as well as the Anti-fouling Systems and Ballast Water Conventions) and improve capacity to respond to incidents involving pollution by oil and hazardous and noxious substances.
- Accelerate ocean economy decarbonisation: Implement national and international low-carbon strategies and further decouple greenhouse gas (GHG) emissions from economic growth, increase the share of renewable sources in the energy supply (in which marine renewable energy plays a role), reduce energy intensity by adopting energy-efficient technologies in manufacturing, transportation and consumer appliances, and phase-out support for fossil fuels. See the *Environment at a Glance: Climate chapter* for more information.
- Adapt coastal communities to the risks from rising sea levels, extreme weather events and other natural hazards (and technological accidents triggered by natural hazards). As appropriate for local contexts, countries should engage with those directly at risk, adopt long-term plans for coastal areas which take future changes into account, implement maritime spatial planning in coherence with coastal zone management, and protect existing coastal ecosystems that can serve as natural buffers.
- Ensure material resources and waste are well managed, for example, by enacting pro-circular economy policies, improving resource efficiency (e.g. efforts to reduce single-use plastics or to promote environmentally sound ship breaking and recycling), and integrating policies on water, materials, product and chemicals management to address the issue of microplastics, marine plastic litter and other pollutants of concern (e.g. nitrogen). See the *Environment at a Glance: Waste chapter* for more information.
- Encourage innovation and mobilise private finance at the scale needed to support these challenges, notably through public (co-)financing that avoids crowding out private efforts and suitably designed policy instruments that provide stringent, flexible and predictable signals to innovators and investors (e.g. OECD, 2011). Removing barriers to market entry and exit is also key.

Ocean-relevant policies cover a wide range of economic sectors and environmental domains. In order for them to be effective, it is essential that they are aligned with other environmental and climate policy priorities and coherent with economic and sectoral policies (e.g. through the use of market-based instruments, such as carbon pricing, and implementing environmental fiscal reforms). It is also important to systematically review the opportunities and threats to marine ecosystems posed by policy measures in other sectors (e.g. fisheries, agriculture, transport, tourism) and to integrate the sustainable use of marine ecosystems into tools such as strategic environmental assessments.

Measuring progress and performance

Reliable, timely and internationally harmonised data on the state of marine ecosystems and pressures thereon, and the benefits generated for human well-being, are required to support policy-making directed at a sustainable ocean economy. Monitoring the various policy instruments and government measures in place is likewise necessary for policy assessment and to support policy reform.

Progress towards a sustainable ocean economy can be assessed against domestic and international goals and commitments where these exist. All indicators presented here are relevant to *Sustainable Development Goal 14*:

Conserve and sustainably use the oceans, seas and marine resources for sustainable development.

This page includes selected sustainable-ocean-related indicators published by the OECD and partner organisations; however, environmental and economic ocean data are immature compared to the terrestrial domain, and considerable data collection and integration challenges remain in order to comprehensively monitor progress towards a sustainable ocean economy. In particular, there is a need to fill data gaps related to measuring and monitoring the status of marine ecosystem services and to strengthen their valuation to identify priorities and address potential trade-offs.

Indicator groups

This work draws inspiration from the OECD *Green Growth indicators* framework (OECD, 2017b), which was developed to improve our understanding of issues at the interface of the environment and the economy in an integrated manner. The following main indicator groups are presented:

- *Natural capital of the ocean*
- *The environmental dimension of well-being and resilience*
- *Environmental and resource productivity*
- *Economic opportunities from pursuing ocean sustainability*
- *Policy responses directed at ocean sustainability*
- *Socio-economic context*

Natural capital of the ocean

Key messages

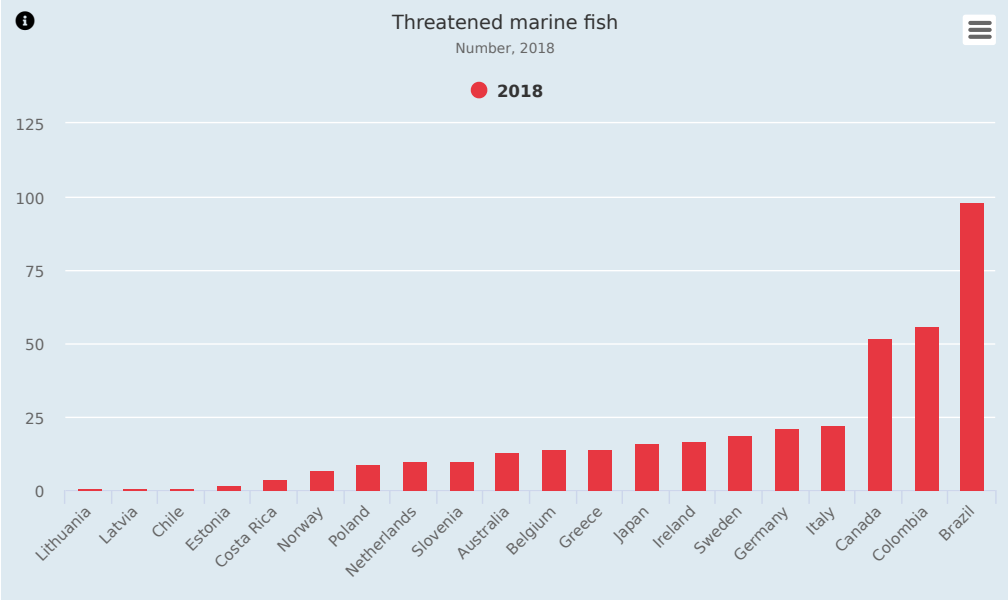
- Marine biodiversity is in a perilous state. Many ecosystems (particularly coral ecosystems) and species are threatened and populations are declining. Practically all indicators give cause for alarm.
- Coastal ecosystems are under increased pressure from urbanisation with OECD coastal areas at least twice as developed than inland areas.
- Continued degradation of ocean natural capital poses a threat to global ecosystem stability and already has perceptible repercussions on human well-being and prospects for sustainable development.

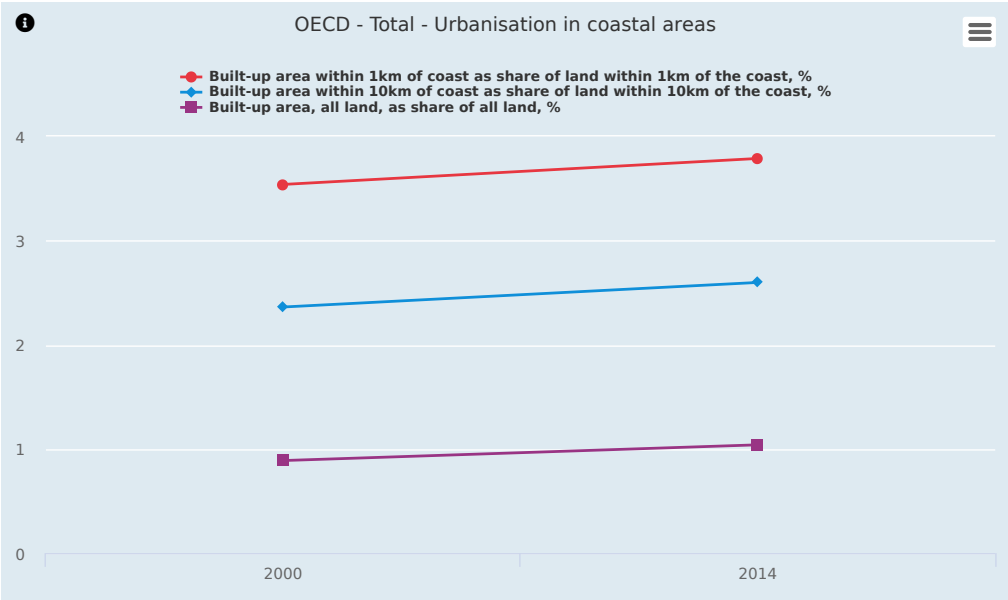
Main trends and recent developments

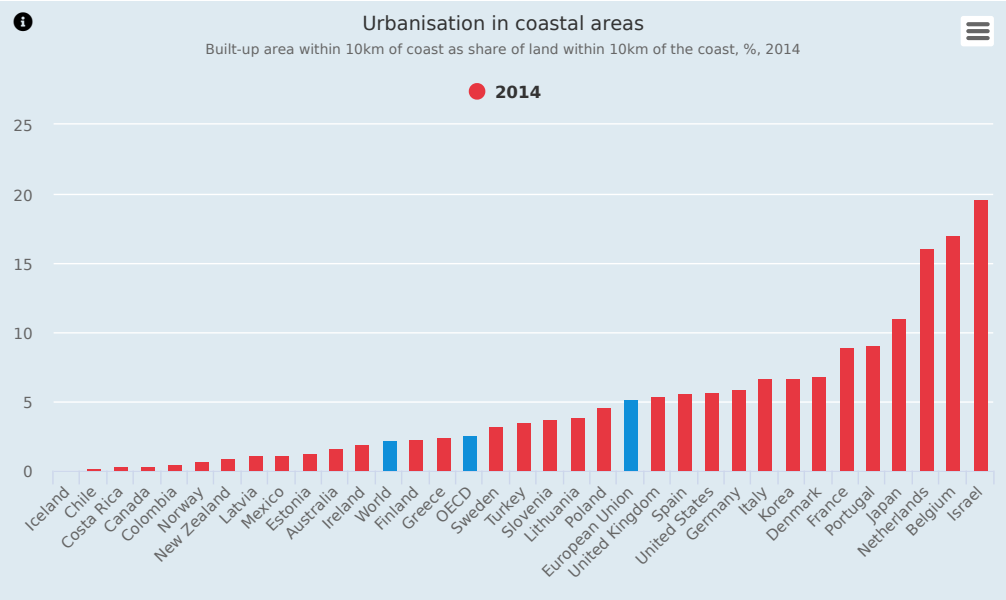
Many **marine fish species are threatened** in countries covered by OECD data, and other state and trend indicators of global marine biodiversity show cause for concern and are often dire. For example, the average population size of marine birds, mammals, reptiles and fish monitored by the Living Planet Index approximately halved since 1970 (WWF, 2015); the IUCN Red List Index which tracks aggregate extinction risk for taxa that have been adequately assessed shows the prospects for corals worsening rapidly (Carpenter et al., 2008); and the IUCN Red List database of threatened species lists almost 1700 marine species as near threatened, vulnerable, endangered or critically endangered (IUCN, 2019).

Coastal areas in the OECD are considerably more built-up than other areas and remaining unbuilt land in coastal areas is being developed faster than inland. In many countries, coastal areas (within 10 km) are more than twice as built-up on average compared to the country as a whole. Land development, along with agricultural land uses, potentially increases pressures on coastal ecosystems via organic (nutrients like nitrogen and phosphorous), inorganic (e.g. industrial chemicals, pesticides) and debris (e.g. microplastics and plastic litter) water pollution as well as via habitat loss and disturbance.

Indicators


Threatened marine fish
Number, 2018
2018
125
100
75
50
25
0
Lithuania
Latvia
Chile
Estonia
Costa Rica
Norway
Poland
Netherlands
Slovenia
Australia
Belgium
Greece
Japan
Ireland
Sweden
Germany
Italy
Canada
Colombia
Brazil


OECD - Total - Urbanisation in coastal areas
Built-up area within 1km of coast as share of land within 1km of the coast, %
Built-up area within 10km of coast as share of land within 10km of the coast, %
Built-up area, all land, as share of all land, %
4
3
2
1
0
2000
2014



Comparability and interpretation

Threatened species include those listed as vulnerable, endangered and critically endangered. Data on **threatened species** are available with varying degrees of completeness. The number of species known or assessed does not always accurately reflect the number of species in existence, and the definitions that should follow IUCN standards are applied with varying degrees of rigour in countries. Historical data are generally not comparable or not available. For many of the incompletely evaluated species groups, assessment efforts have focused on species that are likely to be threatened; therefore any percentage of threatened species reported for these groups would be heavily biased (that is, the % threatened species would likely be an overestimate). For some countries, data include extinct species. Not all species are monitored, in which case their status is unknown.

For further details, see the metadata in the source database listed below under *Data source*.

Environmental and resource productivity

Key messages

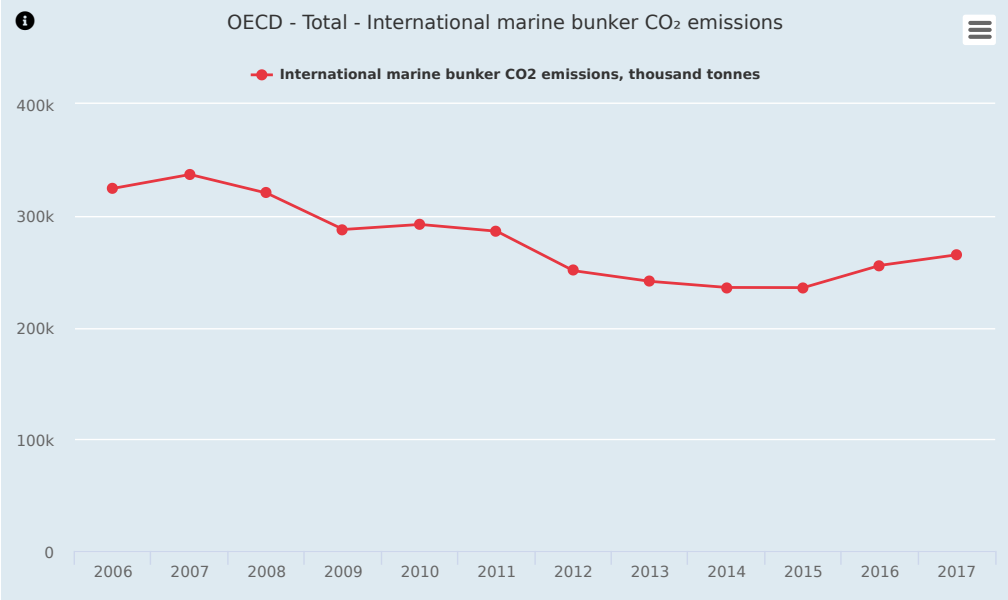
- CO_2 emissions from OECD international marine bunkers have generally decreased to around 265 million tonnes per year; however, this trend shows signs of reversing in recent years.
- OECD international marine bunker CO_2 emissions are a little over 2% of the total emissions from domestic fuel combustion plus international air and marine bunkers. As is to be expected, emissions from international marine trade are large compared to domestic emissions in transit countries.

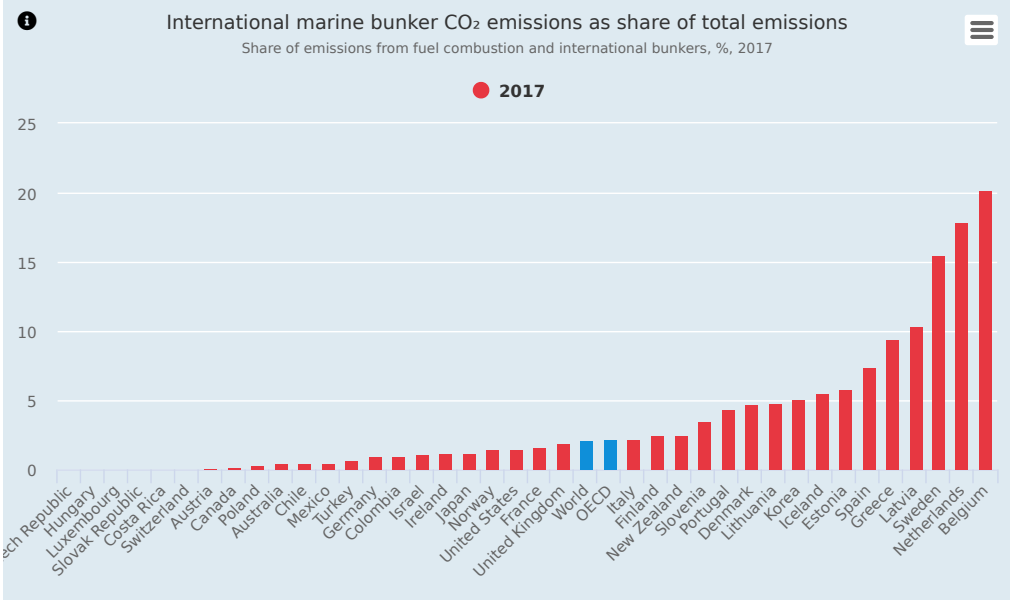
Main trends and recent developments

Emissions from international marine bunkers from OECD shipping generally decreased until recently; however, more information is required to fully capture *efficiency changes* in international shipping. Maritime shipping emissions account for a significant share of global greenhouse gas emissions. OECD international marine bunker CO_2 emissions are a little over 2% of the total emissions from OECD fuel combustion and international air and marine bunkers. Emissions from international marine trade are large compared to domestic emissions in transit countries such as the Netherlands and Belgium. This disconnect between domestic and international emissions highlights the importance of addressing emissions from marine bunkers through cooperative global action.

Measurement challenges exist on air and water emissions from international maritime transport and how they relate to economic performance of the industry, in part due to a lack of established accounting methodologies on how such emissions should be allocated to countries (under the SEEA). There is also a dearth of internationally harmonised data on waste generation, ballast water and brine discharges, oil spills as well as land-based plastic emissions and nutrient loading into the ocean. On-going work (including at the OECD) seeks to address these data gaps.

Indicators





Comparability and interpretation

The total emissions denominator used in the figure above is the sum of emissions from fuel combustion, emissions from international aviation bunkers and emissions from international marine bunkers (allocated to countries based on ports of departure and arrival).

Economic opportunities from pursuing ocean sustainability

Key messages

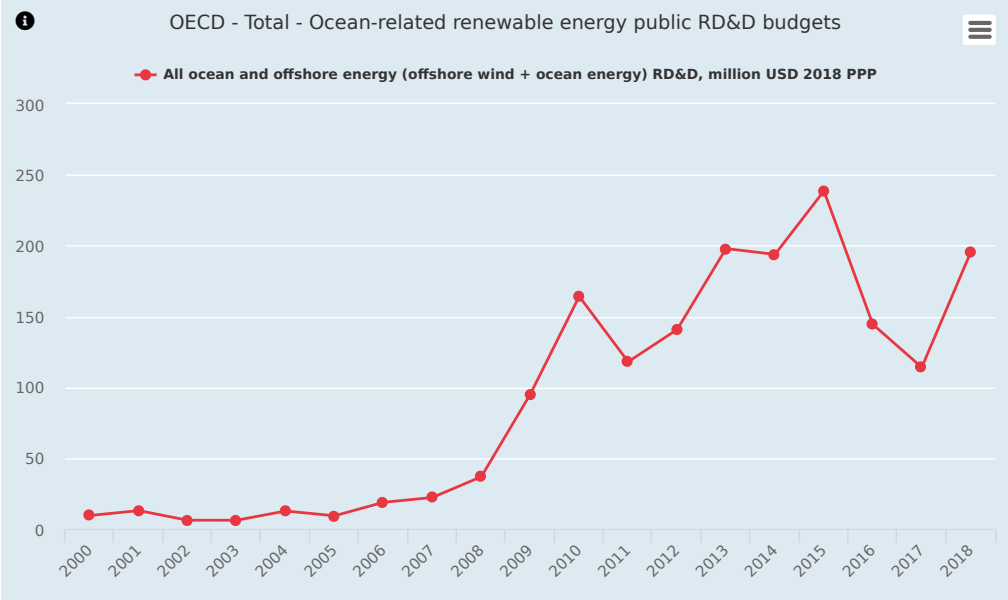
- At under USD 200 million in 2018, public budgets for ocean-related renewable energy technology research, development and demonstration (RD&D) are a very modest share of total energy RD&D budgets in most countries (about 1% on average across OECD). They show no clear overall trend in recent years.
- Technological innovation directed at ocean sustainability is strongly concentrated in a small number of OECD countries that account for almost all relevant inventions.

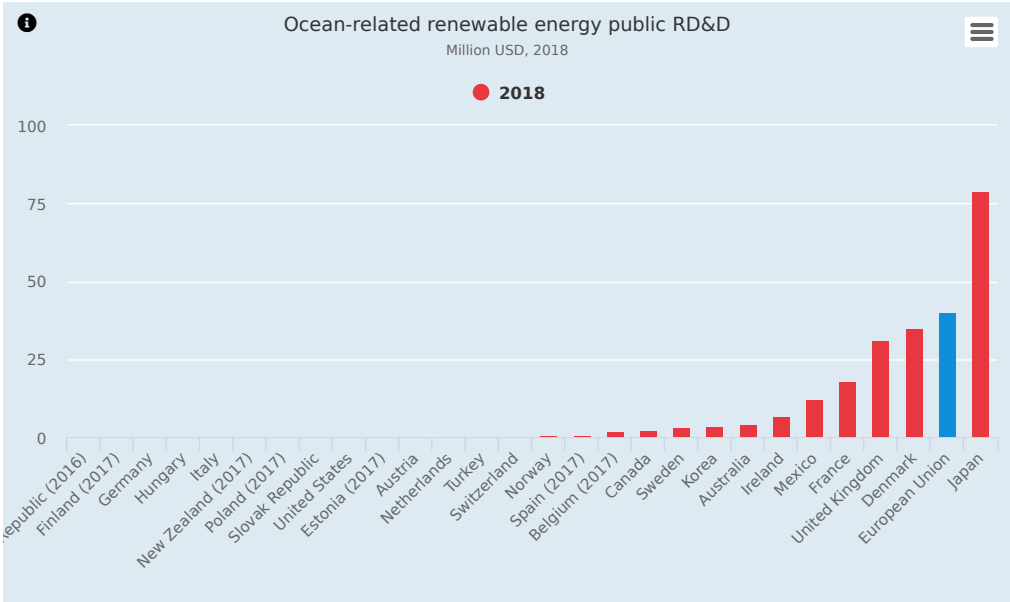
Main trends and recent developments

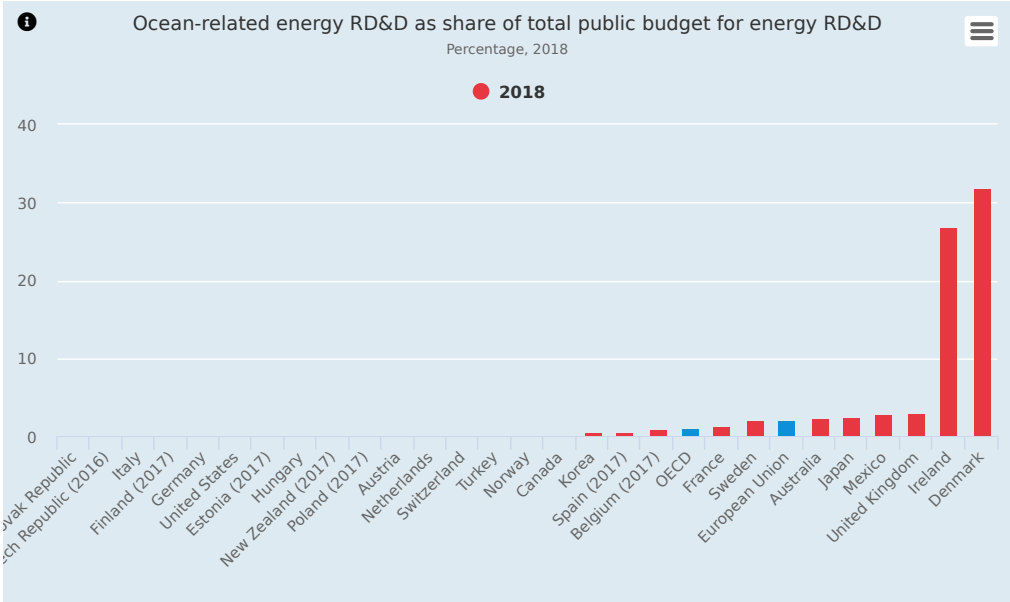
Ocean-related renewable energy public RD&D spending (including tidal, wave, salinity gradient and offshore wind energy) sharply increased around 2008-2010. Japan, the European Union and Denmark invested the most in ocean energy RD&D in 2018 in absolute terms, collectively accounting for more than half the OECD total. Relative to total energy RD&D, Denmark and Ireland most prioritise ocean renewable energy RD&D, followed by the United Kingdom and Mexico.

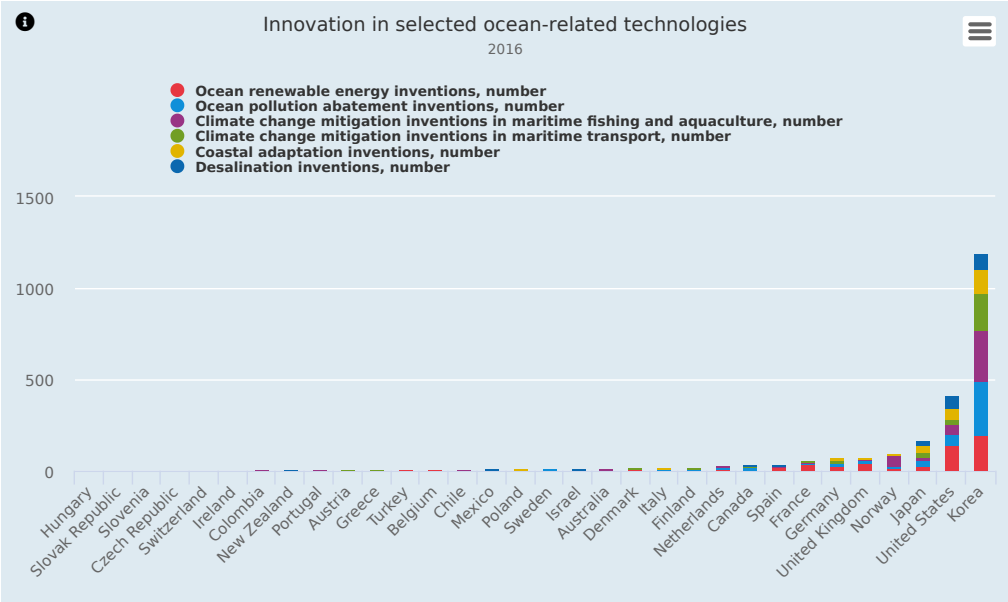
Inventive activity in ocean-related environmental technologies (ENVTECH), measured using patent applications, has grown, particularly in ocean renewable energy, ocean pollution control, climate change mitigation technologies in maritime transport, and mitigation and adaptation technologies in fishing and aquaculture. The number of inventions (patent families) in these domains has more than doubled worldwide since 2000 (160% increase for ocean ENVTECH as a whole). Most (87%) ocean ENVTECH inventions originate in OECD countries – especially in the United States, Korea and Japan, followed by a number of European countries. Development of ocean-related technologies represents an increasingly large share of some countries' overall inventive output, reflecting a high degree of specialisation; for example, this share is 7% in Norway, 17 times the OECD average.

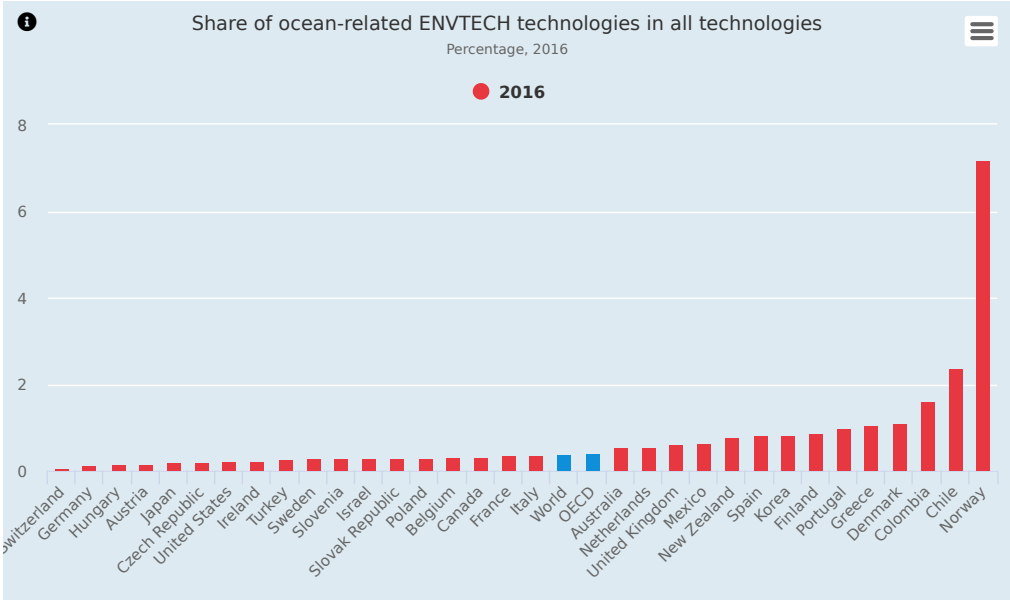
Indicators


OECD - Total - Ocean-related renewable energy public RD&D budgets
All ocean and offshore energy (offshore wind + ocean energy) RD&D, million USD 2018 PPP
300
250
200
150
100
50
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018


Ocean-related renewable energy public RD&D
Million USD, 2018
2018
100
75
50
25
0
Finland (2017)
Germany
Hungary
Italy
New Zealand (2017)
Poland (2017)
Slovak Republic
United States
Estonia (2017)
Austria
Netherlands
Turkey
Switzerland
Norway
Spain (2017)
Belgium (2017)
Canada
Sweden
Korea
Australia
Ireland
Mexico
France
United Kingdom
Denmark
European Union
Japan


Ocean-related energy RD&D as share of total public budget for energy RD&D
Percentage, 2018
2018
40
30
20
10
0
Slovak Republic
Czech Republic (2016)
Italy
Finland (2017)
Germany
United States
Estonia (2017)
Hungary
New Zealand (2017)
Poland (2017)
Austria
Netherlands
Switzerland
Turkey
Norway
Canada
Korea
Spain (2017)
Belgium (2017)
OECD
France
Sweden
European Union
Australia
Japan
Mexico
United Kingdom
Ireland
Denmark


Innovation in selected ocean-related technologies
2016
Ocean renewable energy inventions, number
Ocean pollution abatement inventions, number
Climate change mitigation inventions in maritime fishing and aquaculture, number
Climate change mitigation inventions in maritime transport, number
Coastal adaptation inventions, number
Desalination inventions, number
1500
1000
500
0
Hungary
Slovak Republic
Slovenia
Czech Republic
Switzerland
Ireland
Colombia
New Zealand
Portugal
Austria
Greece
Turkey
Belgium
Chile
Mexico
Poland
Sweden
Israel
Australia
Denmark
Italy
Finland
Netherlands
Canada
Spain
France
Germany
United Kingdom
Norway
Japan
United States
Korea



Comparability and interpretation

Reported public funding for ocean-related renewable energy RD&D peaked in 2015, at USD 240 million for OECD as a whole. The decrease since then may reflect data quality issues, as official RD&D data for the United States is absent post-2015 and is estimated by the IEA as '0' for the period 2015-2018. Prior to this period, the United States accounted for a large share of the OECD ocean-related renewable energy RD&D budget. European Union refers to the budget under Horizon-2020 and not to the sum of national budgets of member states.

Policy responses directed at ocean sustainability

Key messages

- Marine protected areas (MPAs) have consistently expanded in recent years and now cover 21% of OECD exclusive economic zones (EEZ).
- Economic instruments directed at ocean sustainability exist in most countries and most often take the form of taxes. Around 140 ocean-related environmental policy instruments have been identified in OECD countries.
- Revenue from environmentally related taxes in the ocean economy is a small (0.5%) and modestly declining share of total environmentally related tax revenue.
- Fossil fuel support measures in the ocean economy are common and in place in most countries. The 119 measures identified primarily benefit fossil fuel consumers except for some major fossil-fuel producing countries where they mainly benefit producers.

Main trends and recent developments

Since the year 2000, OECD countries overall have considerably expanded **marine protected area networks**; 21% of OECD marine area (compared to 17% of all ocean area under national jurisdiction) are now designated protected and most countries have some system in place (however, establishing effective management plans for MPAs and allocating adequate resources to implement them remains challenging). Protected areas explicitly designated with IUCN management categories Ia, Ib, II, or III (approximately 'marine reserves' insofar that commercial fishing or other extractive activities are generally restricted) are less frequently used, accounting for about 9% of OECD EEZ (however, their adoption by the United States and Australia accounts for virtually all of this; in most countries they are rarely used). Marine coastal areas are about as likely to be protected as non-coastal areas: 21% of OECD and 18% of world marine areas within 10km of the coast are designated protected. However, there is a difference in protection for the immediate shore – more than 30% of OECD land area within 1km of the coast is protected (compared to around 15% for OECD terrestrial areas generally). Marine protected areas are rarely established on the high seas; only 0.5% of the global ocean beyond national jurisdiction is designated protected.

The number of countries with **economic (market-based) instruments targeted at ocean sustainability** has increased notably over time. By 2019, 56 countries had introduced ocean-related instruments, more than three times the number in 1980 (according to data reported to OECD PINE database). Among these, **taxes** are the most common instrument type (both across countries and over time). More than 40 countries have introduced ocean-related taxes (such as taxes on fisheries, maritime transportation or marine pollution) and more taxes have been introduced every year than any other instrument type. Even though most ocean-related instruments are taxes, the share of **tradable permit systems** is highest in the ocean domain (more than in any other environmental domain). Ocean-related tradable permit systems include, for example, individual fishing quotas (Australia, Estonia, Iceland, Canada, the United Kingdom and the United States), transferable vessel quotas (Spain) and territorial user rights (Mexico and Chile).

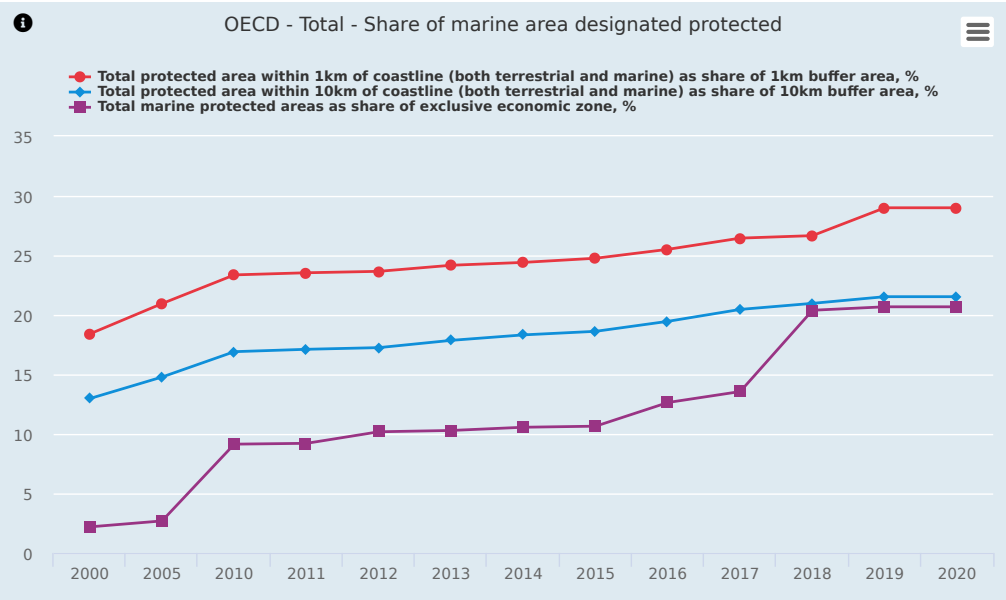
Ocean-related **fees and charges** have been introduced in at least 24 countries, with examples such as entrance fees to national parks, fees on fishing licenses, charges on sewage discharge into the ocean (e.g. in the Great Barrier Reef area in Australia) and various non-compliance fines. **Environmentally motivated subsidies** relevant for the ocean have been reported in at least 19 countries. Examples include feed-in tariffs for offshore wind, tide and wave power generation (Argentina, Canada, Denmark, France, Korea, the United Kingdom) and conservation grants to preserve marine biodiversity (Sweden).

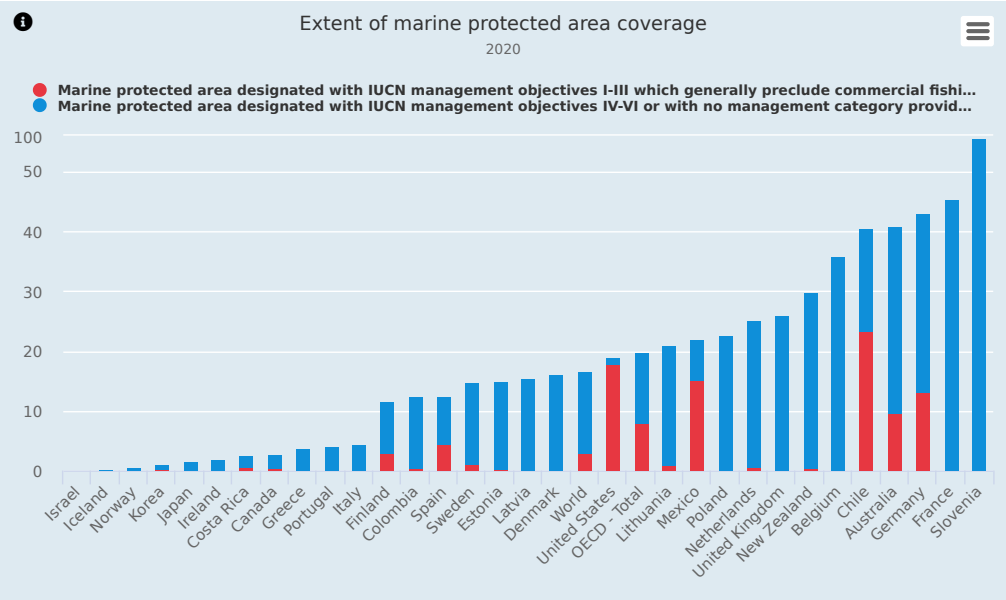
In the OECD area, **ocean-sustainability-related taxes raised USD 4 billion in 2018,** a level which has remained broadly stable since 2000 (despite the growing number of such taxes implemented). The share of ocean-related tax revenue in total

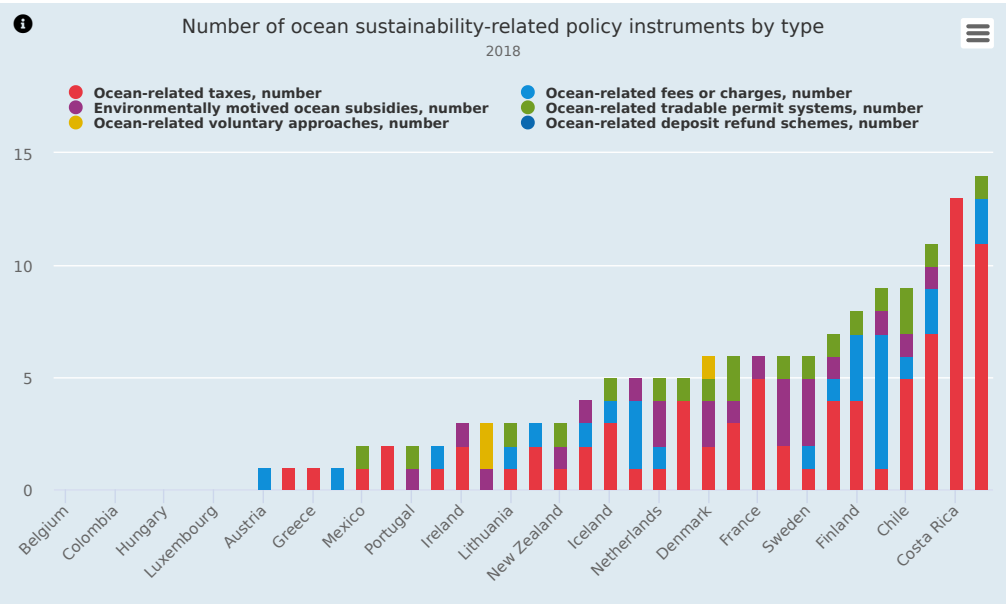
Environmentally Related Tax Revenue (ERTR) is actually decreasing, and now accounts for less than 0.5% of total ERTR. Pollution and transport dominate the tax base, accounting for 39% and 38% of ocean-related tax revenue in 2018 respectively. Energy taxes (e.g. fuel for maritime transport) raise 19% of ocean-related revenue, while revenue from taxes on ocean resources (e.g. fishing taxes) are very low compared to other tax bases, representing only 3% of ocean ERTR.

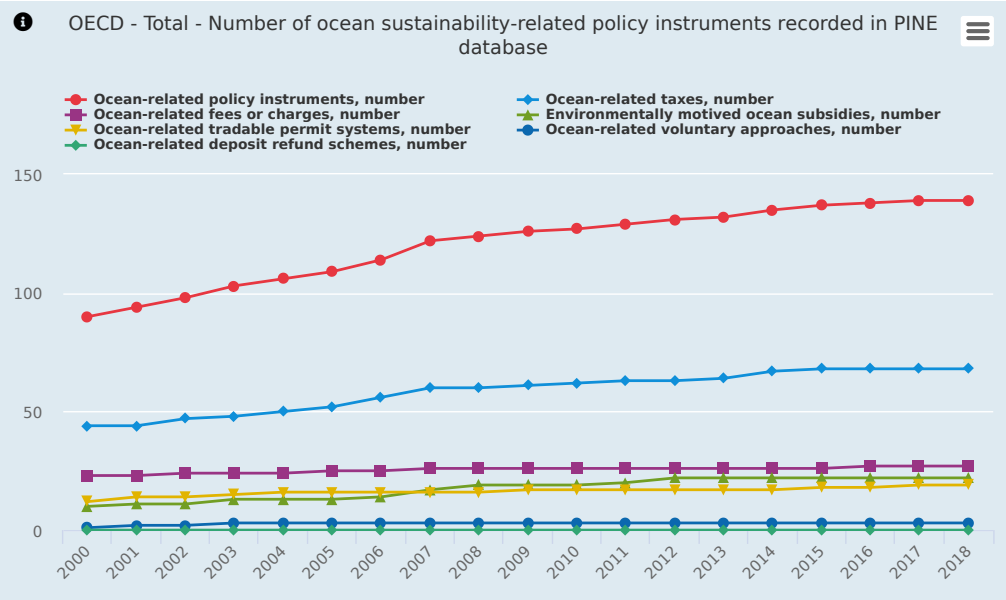
A large number of **ocean-related fossil fuel support measures** are in effect with 119 measures identified in 30 countries (of the 42 countries covered by the OECD Inventory of Fossil Fuel Support Measures). Fossil-fuel producing countries (e.g., Australia, Brazil, the United Kingdom, the United States and the Russian Federation) mostly support offshore extraction and general services via measures such as preferential tax treatment for entities with offshore oil & gas extraction; research and exploration activities; port infrastructure upgrades for increased fossil fuel trade capacity; and capacity building on decommissioning activities. Norway is an exception: despite being a major offshore oil & gas producer, most of its ocean-related support is for the transport and the fisheries & aquaculture sectors. Other countries that are mainly consumers of fossil fuels tend to divide their ocean-related support between the fisheries & aquaculture and the transportation sectors (e.g. via preferential tax rates on fuels used in fisheries & aquaculture or in maritime transport).

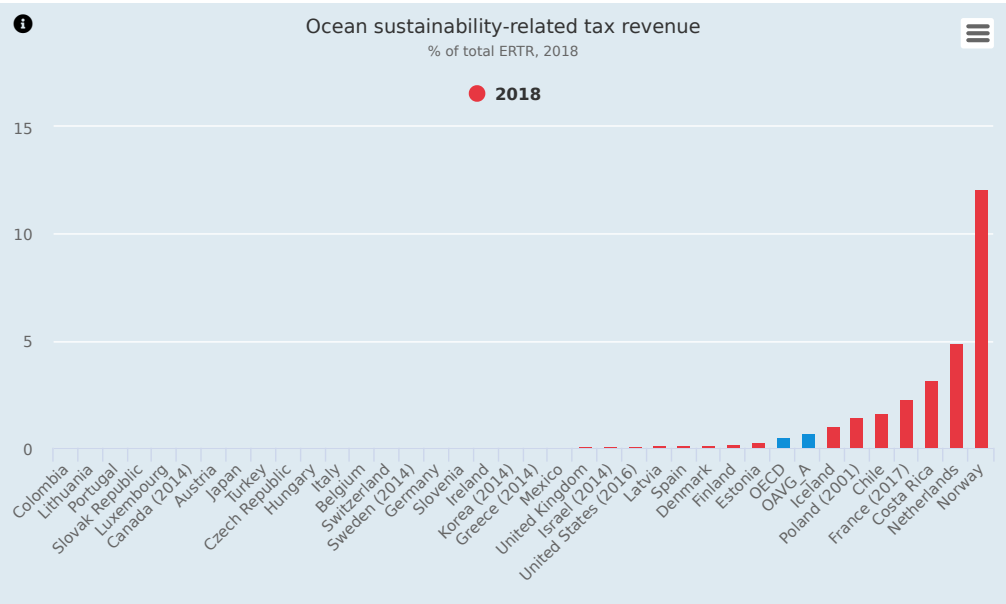
Indicators

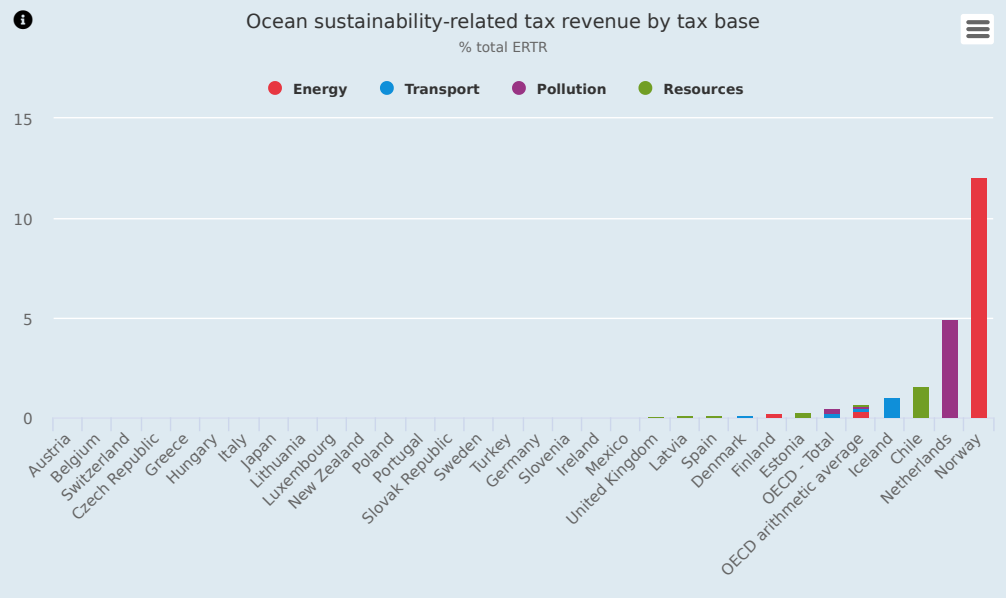


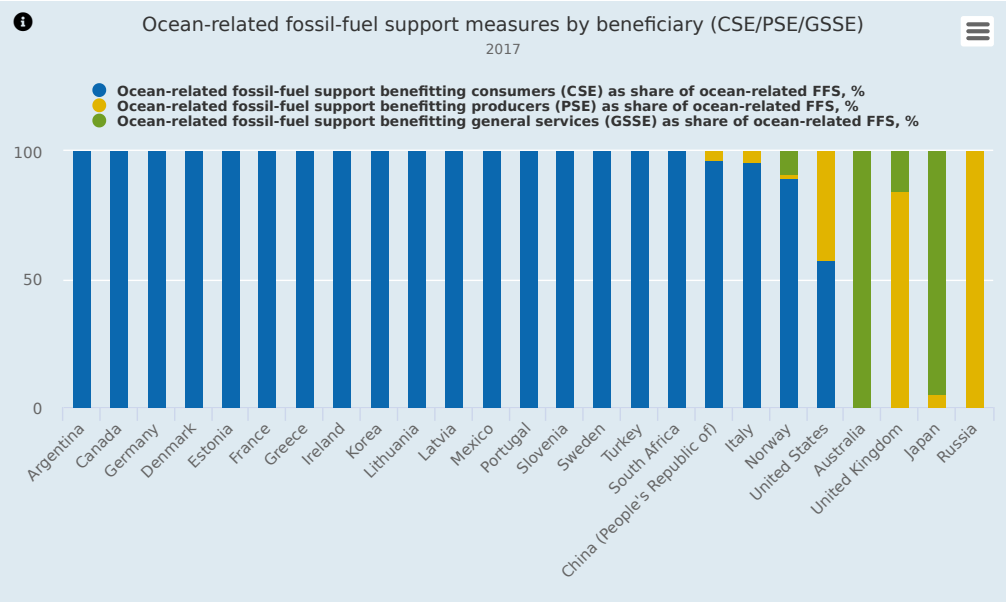

Extent of marine protected area coverage
2020
Marine protected area designated with IUCN management objectives I-III which generally preclude commercial fishi...
Marine protected area designated with IUCN management objectives IV-VI or with no management category provid...
100
50
40
30
20
10
0
Israel
Iceland
Norway
Korea
Japan
Ireland
Costa Rica
Canada
Greece
Portugal
Italy
Finland
Colombia
Spain
Sweden
Estonia
Latvia
Denmark
World
United States
OECD - Total
Lithuania
Mexico
Poland
Netherlands
United Kingdom
New Zealand
Belgium
Chile
Australia
Germany
France
Slovenia

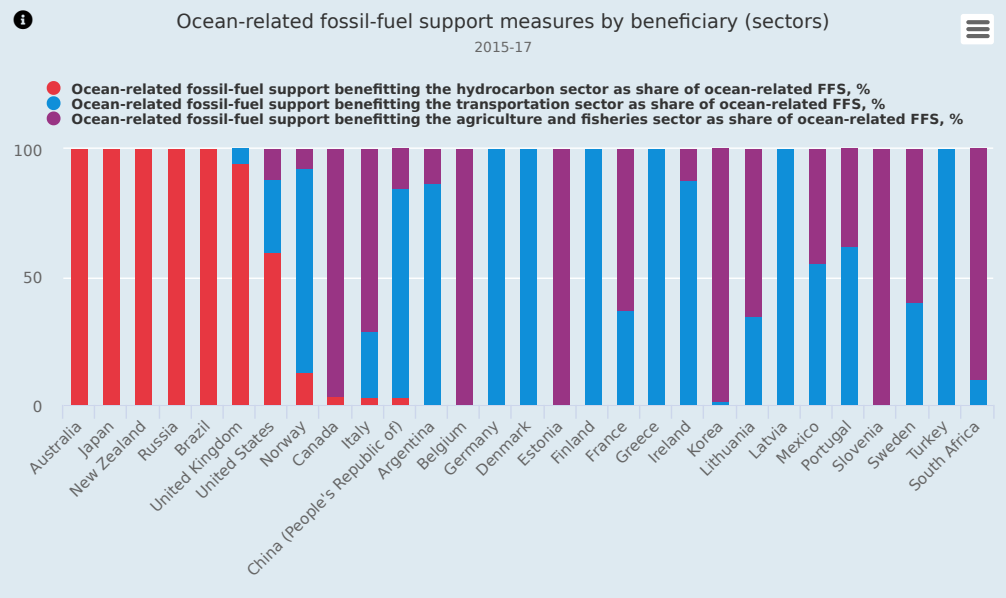

Number of ocean sustainability-related policy instruments by type
2018
Ocean-related taxes, number
Environmentally motived ocean subsidies, number
Ocean-related voluntary approaches, number
Ocean-related fees or charges, number
Ocean-related tradable permit systems, number
Ocean-related deposit refund schemes, number
15
10
5
0
Belgium
Colombia
Hungary
Luxembourg
Austria
Greece
Mexico
Portugal
Ireland
Lithuania
New Zealand
Iceland
Netherlands
Denmark
France
Sweden
Finland
Chile
Costa Rica


OECD - Total - Number of ocean sustainability-related policy instruments recorded in PINE database
Ocean-related policy instruments, number
Ocean-related fees or charges, number
Ocean-related tradable permit systems, number
Ocean-related deposit refund schemes, number
Ocean-related taxes, number
Environmentally motived ocean subsidies, number
Ocean-related voluntary approaches, number
150
100
50
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018


Ocean sustainability-related tax revenue
% of total ERTR, 2018
2018
15
10
5
0
Colombia
Lithuania
Portugal
Slovak Republic
Luxembourg
Canada (2014)
Austria
Japan
Turkey
Czech Republic
Hungary
Italy
Belgium
Switzerland
Sweden (2014)
Germany
Slovenia
Ireland
Korea (2014)
Greece (2014)
Mexico
United Kingdom
Israel (2014)
United States (2016)
Latvia
Spain
Denmark
Finland
Estonia
OECD
OAVG_A
Iceland
Poland (2001)
Chile
France (2017)
Costa Rica
Netherlands
Norway


Ocean sustainability-related tax revenue by tax base
% total ERTR
Energy
Transport
Pollution
Resources
15
10
5
0
Austria
Belgium
Switzerland
Czech Republic
Greece
Hungary
Italy
Japan
Lithuania
Luxembourg
New Zealand
Poland
Portugal
Slovak Republic
Sweden
Turkey
Germany
Slovenia
Ireland
Mexico
United Kingdom
Latvia
Spain
Denmark
Finland
Estonia
OECD - Total
OECD arithmetic average
Iceland
Chile
Netherlands
Norway


Ocean-related fossil-fuel support measures by beneficiary (CSE/PSE/GSSE)
2017
Ocean-related fossil-fuel support benefitting consumers (CSE) as share of ocean-related FFS, %
Ocean-related fossil-fuel support benefitting producers (PSE) as share of ocean-related FFS, %
Ocean-related fossil-fuel support benefitting general services (GSSE) as share of ocean-related FFS, %
100
50
0
Argentina
Canada
Germany
Denmark
Estonia
France
Greece
Ireland
Korea
Lithuania
Latvia
Mexico
Portugal
Slovenia
Sweden
Turkey
South Africa
China (People's Republic of)
Italy
Norway
United States
Australia
United Kingdom
Japan
Russia



Comparability and interpretation

Protection designation does not guarantee that the area in question is effectively managed or appropriately located; and empirical studies of the effectiveness of marine protected areas in conserving biodiversity show mixed results (e.g. Dureuil et al., 2018). On a more technical level, the UNEP-WCMC's World Database of Protected Areas (WDPA) relies on regular submissions of data from countries and other data providers; therefore, where these have not been provided the database is incomplete or outdated. Furthermore, protected area attribute fields (such as the management category) can be missing or incomplete so these measures are not perfectly reliable. Some designated marine protected areas target only a narrow range of species (or even just a single species) through (e.g.) proscription of a particular fishing technique, but without any special restrictions on other high-impact activities that may harm biodiversity and are therefore only marginally more protected than other areas.

Care should be taken when interpreting the economic instrument counts. The existence of an instrument does not guarantee its enforcement; moreover, the level of stringency might not be adequate for the desired environmental outcome and the pattern of instrument types recorded in the OECD Policy Instruments for the Environment (PINE) database may not be representative of all existing instruments.

The indicators on environmentally related taxes should not be used to assess the "environmental friendliness" of the tax systems. For such analysis, additional information, describing the economic and taxation structure of each country, is required. Moreover, a number of environmentally related taxes can have important environmental impacts, even if they raise little (or no) revenue. In addition, revenue from fees and charges, and from royalties related to resource management, is not included.

The proportion of benefitting fossil fuel support (FFS) consumption sectors is calculated using the median of ocean-related FFS measures with active fund disbursements in 2015-2017. These disbursements (targeting specific known fuels) are allocated to sectors using country-level sectoral energy consumption data from the IEA's *World Energy Balances*.

The environmental dimension of well-being and resilience

Forthcoming in 2021-22

Socio-economic context

Key messages

- Physical volumes of OECD marine landings (fish catches) have declined. The nominal value of catches has remained broadly stable.
- OECD marine aquaculture production has increased in volume and notably increased in nominal value.
- Employment in fishing has modestly decreased in OECD countries while employment in aquaculture and fish processing has remained stable.
- OECD fishing fleet sizes have declined in terms of number of vessels and tonnage.
- The nominal value of trade in fisheries products has increased since 2008. OECD countries are net importers of fish products.
- Marine container transport in OECD has increased consistently and is now more than twice as large in tonnage and container number than in the early 2000s. Coastal and inland shipping has decreased.
- Sea passenger tourism receipts (tourism "exports") as a share of total tourism receipts have been stable or modestly increasing on average. They are mostly a small part of inbound tourism spending except for in the Baltic states. Equivalent expenditures (tourism "imports") have slowly declined as a share of total tourism expenditures.
- About a quarter of the overall OECD population lives within 10km of the coast. More than half of residents live within 10km of the coast in nine OECD countries.

Main trends and recent developments

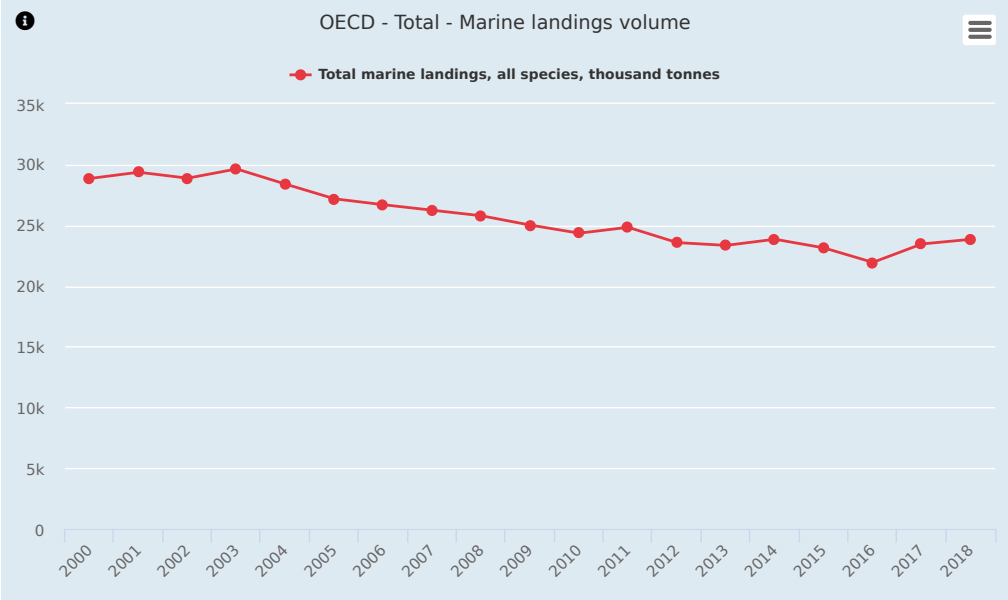
Based on the currently available data, several notable trends are observed. For example, OECD aquaculture production has considerably increased in volume and more than doubled in nominal value since 2005 (however, the People's Republic of China remains the largest aquaculture producer, overall producing more farmed food fish than the rest of the world combined). Another remarkable trend is the consistent increase in marine trade, which reached 229 million containers handled by OECD ports in 2018, or seven twenty-foot equivalent units (TEUs) every second (reflecting economic growth and an increase in global trade generally).

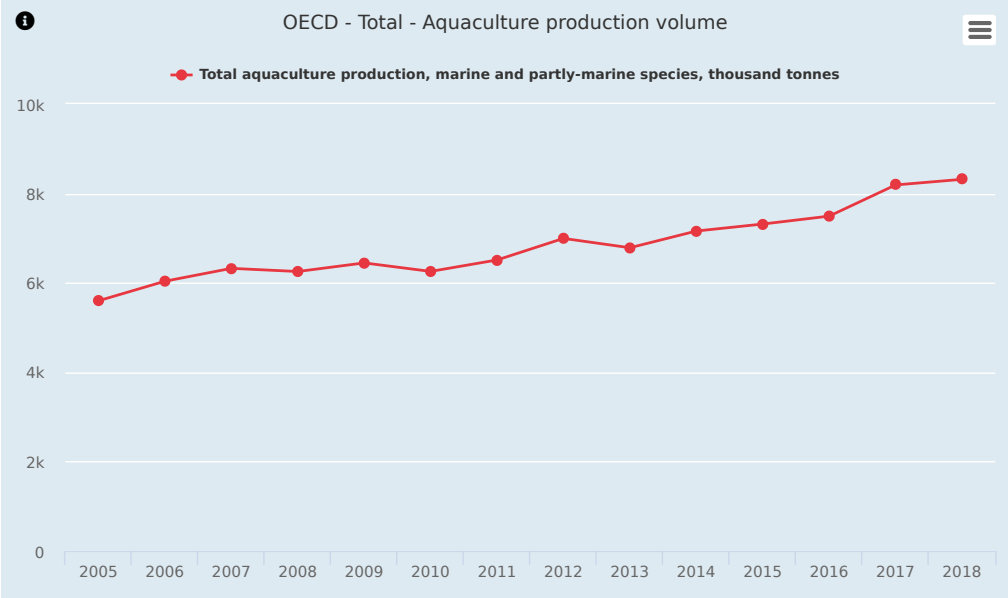
Measurement challenges

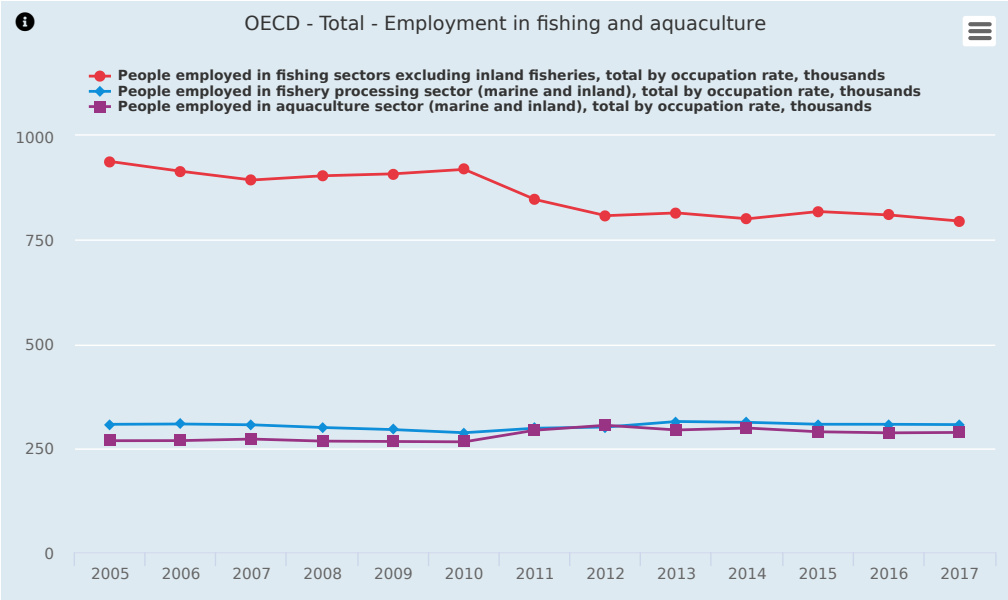
This section presents contextual indicators such as population living in coastal areas, factor inputs of selected ocean industries (labour, energy, produced capital) and their output (revenue, value added). However, major information gaps persist, notably concerning internationally harmonised economic and environmental statistics on ocean industries, e.g., value added, employment but also energy consumption, air and water emissions, and use of other marine ecosystem services by industries such as coastal and marine tourism, offshore energy, maritime transport or port activities. There is also a dearth of data on sustainably managed fisheries and on environmental certification in aquaculture production. Such information is needed to draw a more complete picture of the ocean economy and its sustainability. The OECD and its international partners have been active in this area (e.g. OECD, 2016) and work is on-going on developing ocean economic accounts consistent with the System of National Accounts (SNA) as well as on developing ocean environmental accounts consistent with the System of Environmental-Economic Accounting (SEEA).

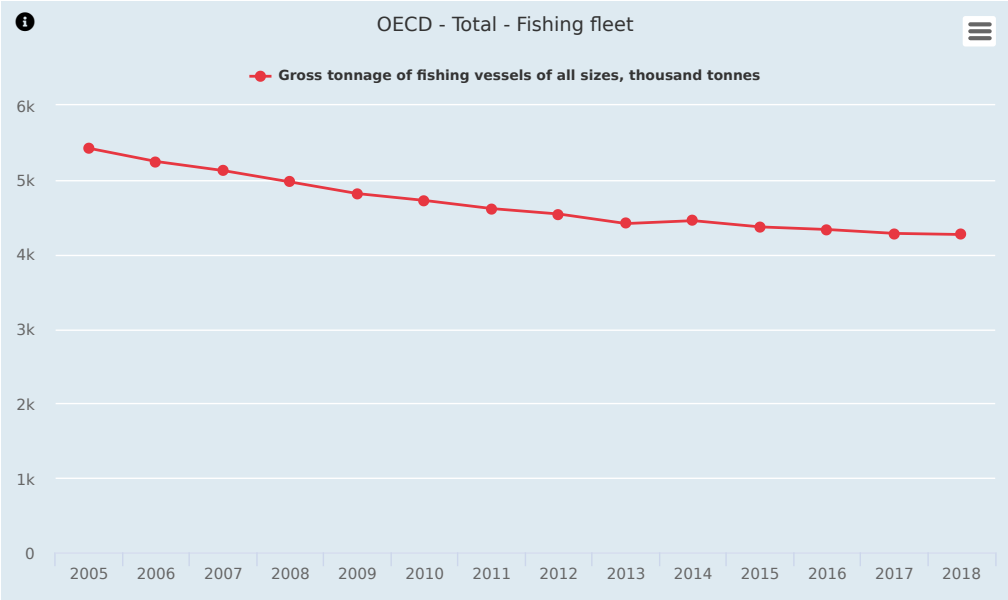
In the meantime, ocean industries remain only partially covered in the OECD database. Data on selected ocean-related activities is presented, where available, noting that often little or no harmonised data on the sustainability aspects of these sectors can be currently identified and presented. Addressing these information gaps is important so that the sustainability of these sectors and industries can be assessed. As accounting methodologies are developed and internationally harmonised data become available, more data and indicators will be included under the various thematic headings above.

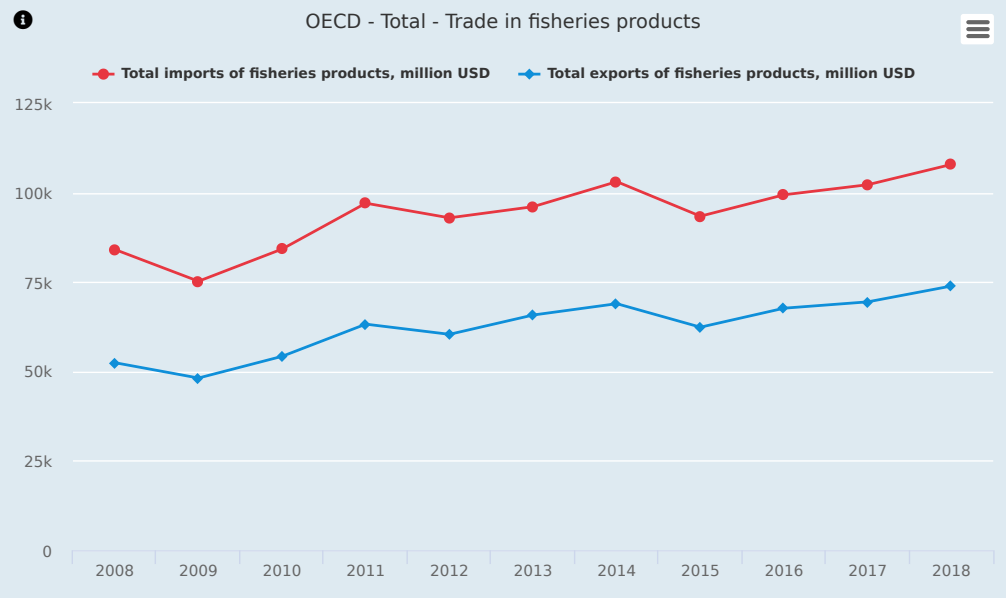
Indicators

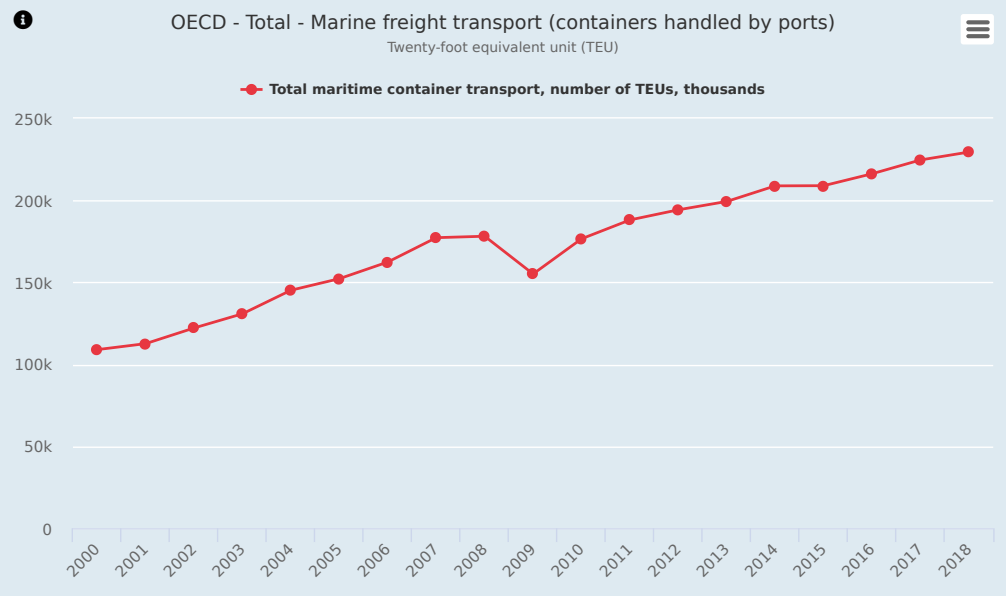

OECD - Total - Marine landings volume
Total marine landings, all species, thousand tonnes
35k
30k
25k
20k
15k
10k
5k
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

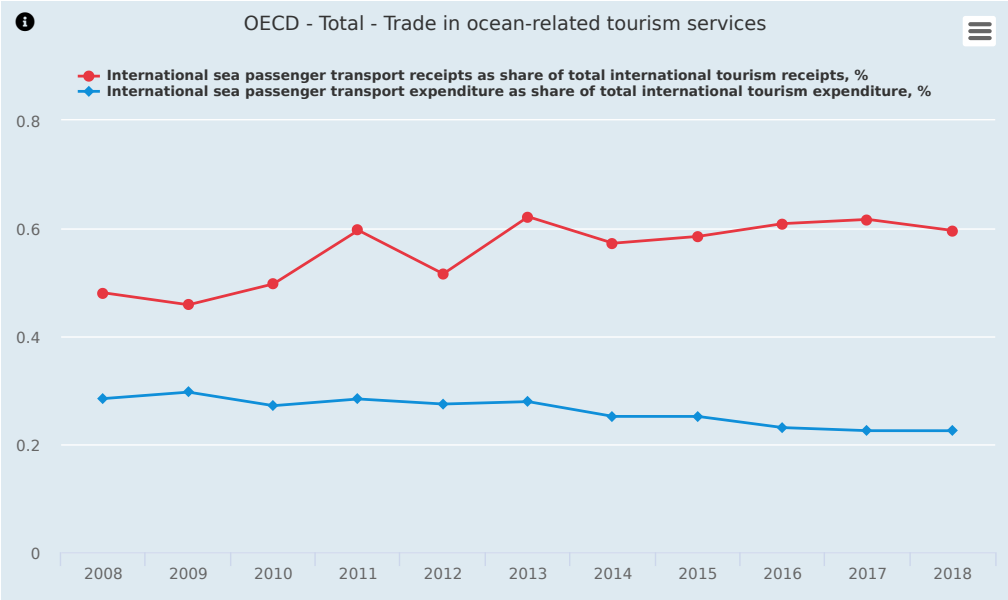

OECD - Total - Aquaculture production volume
Total aquaculture production, marine and partly-marine species, thousand tonnes
10k
8k
6k
4k
2k
0
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

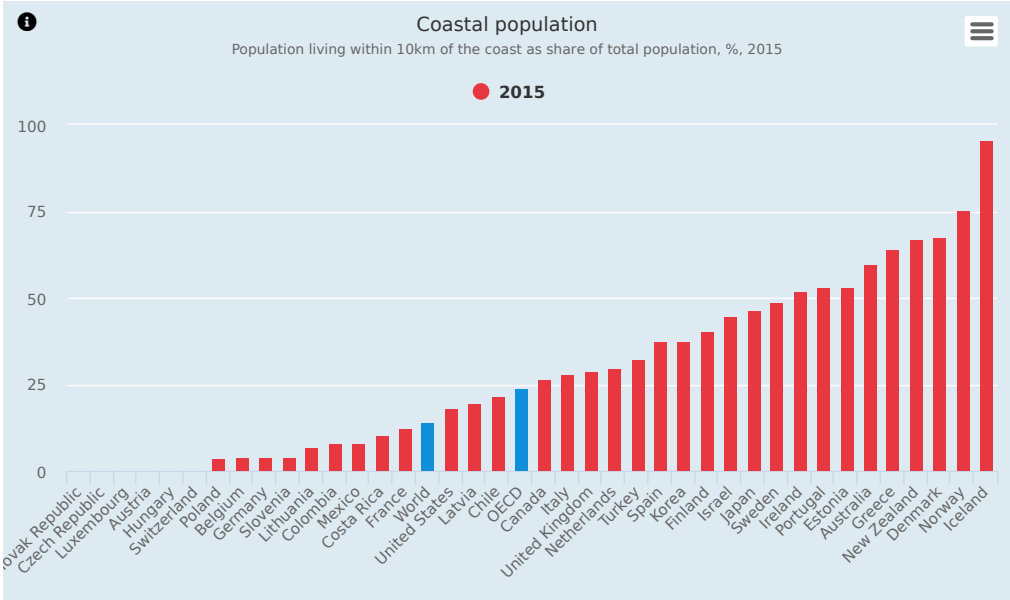

OECD - Total - Employment in fishing and aquaculture
People employed in fishing sectors excluding inland fisheries, total by occupation rate, thousands
People employed in fishery processing sector (marine and inland), total by occupation rate, thousands
People employed in aquaculture sector (marine and inland), total by occupation rate, thousands
1000
750
500
250
0
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017


OECD - Total - Fishing fleet
Gross tonnage of fishing vessels of all sizes, thousand tonnes
6k
5k
4k
3k
2k
1k
0
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018


OECD - Total - Trade in fisheries products
Total imports of fisheries products, million USD
Total exports of fisheries products, million USD
125k
100k
75k
50k
25k
0
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018


OECD - Total - Marine freight transport (containers handled by ports)
Twenty-foot equivalent unit (TEU)
Total maritime container transport, number of TEUs, thousands
250k
200k
150k
100k
50k
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018


OECD - Total - Trade in ocean-related tourism services
International sea passenger transport receipts as share of total international tourism receipts, %
International sea passenger transport expenditure as share of total international tourism expenditure, %
0.8
0.6
0.4
0.2
0
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018


Coastal population
Population living within 10km of the coast as share of total population, %, 2015
2015
100
75
50
25
0
Czech Republic
Luxembourg
Austria
Hungary
Switzerland
Poland
Belgium
Germany
Slovenia
Lithuania
Colombia
Mexico
Costa Rica
France
World
United States
Latvia
Chile
OECD
Canada
Italy
United Kingdom
Netherlands
Turkey
Spain
Korea
Finland
Israel
Japan
Sweden
Ireland
Portugal
Estonia
Australia
Greece
New Zealand
Denmark
Norway
Iceland

Comparability and interpretation

These observations cover OECD member countries for which data are available; global trends may differ. The reported OECD aggregates do not generally cover *all* members (either because of incomplete data or because the indicator does not apply (e.g. landlocked countries). In general, around 30 of 37 OECD members are included (depending on topic and year) with the exception of tourism receipts and revenues where data is only available for around 20 OECD members. For indicators on flows, aggregated values include flows between member countries. When calculating aggregates where country-data-years are missing, missing values are interpolated where possible or else back-and-forward filled using the closest valid value. Sometimes this involves filling data several years from the nearest value so some caution in interpreting the OECD value is warranted. Refer to the OECD *Sustainable Ocean Economy Database* metadata for comprehensive information.

Marine freight measures freight passing through ports therefore for each departure is there is also at least one corresponding arrival elsewhere. Consequently, individual freight items will often be counted more than once.

Glossary

Aquaculture production	Aquaculture is the farming of aquatic organisms including fish, molluscs, crustaceans and aquatic plants. Farming implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. Farming also implies individual or corporate ownership of the stock being cultivated. Fish, crustaceans, molluscs, and all other aquatic organisms are classified according to the FAO International Standard Statistical Classification of Aquatic Animals and Plants (ISSCAAP). In this dataset, only species considered to be marine or partly marine are selected. The included species list can be found in the ocean database metadata.
Built-up area	“Built-up" is defined as the presence of buildings (roofed structures). Coastal area is defined as the area within 1km or within 10km of the coast.
Employment in fishing	Commercial, industrial and subsistence fishers, operating in freshwater, brackish water, and marine waters in economically inspired efforts to catch and land any of the great variety of aquatic animals and plants and also people working on fish farms, hatcheries, processing, and employed in shellfish culture operations.
Fishing fleet	Vessels engaged in catching operations only.
International marine bunker CO_2 emissions	International marine bunkers contains emissions from fuels burned by ships of all flags that are engaged in international navigation. The international navigation may take place at sea, on inland lakes and waterways, and in coastal waters. Consumption by ships engaged in domestic navigation is excluded. The domestic/international split is determined on the basis of port of departure and port of arrival, and not by the flag or nationality of the ship. Consumption by fishing vessels and by military forces is also excluded.
Marine freight transport	Containers are a special box to carry freight, strengthened and stackable and allowing horizontal or vertical transfers. Swap bodies are excluded. Coastal shipping or short sea shipping is the movement of cargo by sea between ports situated within a relatively narrow geographical area. Included in such movements would be ferry and feeder traffic. For Europe, short sea shipping would consist of the movement of cargo by sea between ports situated in Europe as well as between ports in Europe and ports situated in non-European countries having a coastline on the enclosed seas bordering Europe.
Marine landings	Fish, crustaceans, molluscs and other aquatic invertebrates (and animals), residues and seaweeds on a landed weight basis, i.e. the mass (or weight) of a product at the time of landing, regardless of the state in which is landed (i.e. whole, gutted, filleted, meal, etc.). Data cover all industrial, artisanal and subsistence fisheries, excluding aquaculture.
Ocean and offshore energy public RD&D budgets	Energy RD&D covers basic and applied research, experimental development, and demonstration related to the production, storage, transportation, distribution and use of all forms of energy. Shown here are data for the following ocean-related renewable energy sectors: Offshore wind RD&D activities which focus on the performance and the reliability of these technologies. Ocean energy, including technologies that harness the physical properties of the ocean to generate electricity from tidal energy, wave energy, and salinity gradient power. RD&D activities for this sector includes the design and development of equipment and turbine technology, as well as the research on the effect on marine life of ocean energy.
Ocean-sustainability-related inventions	The number of inventions (simple patent families) developed by a country’s inventors, independent of the jurisdictions where a patent application has been registered (i.e. all known patent families worldwide are considered). Patents in ocean-related ENVTECH technologies represent only a small portion of overall patenting activity. Therefore, prior to data retrieval from a worldwide patent database, a search strategy is used to identify the relevant patent documents using common patent classification systems. For more details, see the metadata to the OECD *Sustainable Ocean Economy Database*.
Ocean-sustainability-related policy instruments	Policy instruments such as taxes, fees and charges, tradable permits, environmentally motivated subsidies, deposit refund schemes and voluntary approaches directed at ocean sustainability. Examples include taxes on fishing, taxes on maritime transport, import duties on vessels, fees on access to marine reserve parks, fishing licenses, coastal protection subsidies, subsidies for offshore wind electricity generation, individual transferable quotas for fisheries, etc. Data are extracted from the OECD Policy Instruments for the Environment (PINE) database (*http://oe.cd/pine*). The PINE database, contains quantitative and qualitative information on over 3500 policy instruments in 110 countries worldwide. Policy instruments are tagged into 13 environmental domains that represent the focal issues (environmental externalities). Instruments can have both a direct and an indirect effect on several environmental domains; however, only the domain to which the instrument has a direct effect is considered. Ocean sustainability is the most recent domain added to the database. For more details, see the metadata to the OECD *Sustainable Ocean Economy Database*

Ocean- sustainability-related tax revenue	Revenue raised from taxes and auctioning of tradable permits directed at ocean sustainability. These include specific taxes on i) energy products for maritime transport purposes; ii) maritime vessels and transport infrastructure (e.g. one-off or recurrent taxes on ownerships and use of boats); iii) ocean pollution (e.g. discharges into the ocean); and iv) ocean-resource extraction (e.g. fishing taxes, revenue from auctioning of individual transferable quotas for fisheries). The information on taxes and the associated tax revenue is extracted from the OECD Policy Instruments for the Environment (PINE) database (*http://oe.cd/pine*). The PINE database, contains quantitative and qualitative information on over 3500 policy instruments in 110 countries worldwide. Policy instruments are tagged into 13 environmental domains that represent the focal issues (environmental externalities). Instruments can have both a direct and an indirect effect on several environmental domains; however, only the domain to which the instrument has a direct effect is considered. Ocean sustainability is the most recent domain added to the database. For more details, see the metadata to the OECD *Sustainable Ocean Economy Database.*
Ocean-related fossil fuel support measures	Direct budgetary support and tax expenditures supporting the production or consumption of fossil fuels. Following the OECD's PSE-CSE framework the measures benefitting fossil fuel producers are classified as the Producer Support Estimate (PSE) while those that benefit individual fossil fuel consumers are classified under the Consumer Support Estimate (CSE). A third category, the General Services Support Estimate (GSSE), is assigned for measures that do not currently increase fossil fuel production and consumption but may do so in the future. The OECD Inventory of Fossil Fuel Support Measures (*http://oe.cd/fossil-fuels*) identifies the type of fossil fuels benefitted by each measure and presents a breakdown of the amount of support by assigning fuel type tags. In cases where this breakdown is not available in official government sources, the OECD performs data transformation procedure to allocate support to individual fuel tags according to the relative value of production or consumption as calculated from the IEA's World Energy Balances database. Note that measures can benefit more than one type of fossil fuel at the same time and can thus receive multiple fuel tags in this respect. For example, a measure granting lower sales tax rates for road transport fuels will receive multiple fuel tags such as motor gasoline, diesel, LPG and natural gas. Building on this methodology, an additional binary tag is developed for ocean-related government support for fossil fuels. This tagging strategy is detailed in the metadata to the OECD *Sustainable Ocean Economy Database*.
Protected area	Area of land or sea especially dedicated to the protection and maintenance of biological diversity and of natural and associated cultural resources, and managed through legal or other effective means. The data refer to the World Conservation Union (IUCN) management categories I-VI. National classifications may differ. The data cover areas under the management categories: • I (strict nature reserves and wilderness areas), • II (national parks), • III (natural monument or feature) • IV (habitat or species management area), • V (protected landscape or seascape) and • VI (protected area with sustainable use of natural resources). • Areas nationally/internationally designated without any IUCN category assigned are also included. This category includes regional and international designations such as the European Natura 2000 network. In general, under the 1982 UN Convention on the Law of the Sea the EEZ of a country extends 200 nautical miles from the coastline, or to the mid-point between coastlines where the EEZ of different countries would otherwise overlap. Coastal area is here defined as the area within 1km or within 10km of the coast, including the terrestrial shoreline.
Threatened species	The number of threatened species compared to the number of known or assessed species. "Threatened" refers to the categories of "endangered", "critically endangered" and "vulnerable" species (i.e. species in danger of extinction and species soon likely to be in danger of extinction), as defined by the IUCN.
Tourism receipts and expenditure – sea passengers	Passenger services cover the transport of people. This category covers all services provided in the international transport of non-residents by resident carriers (credit or international passenger transport receipts) (similar to exports) and that of residents by non-resident carriers (debit or international passenger transport expenditure) (similar to imports). Passenger services include fares and other expenditure related to the carriage of passengers, any taxes levied on passenger services, and fares that are a part of package tours, cruise fares, rentals, charters, and leases of vessels, aircraft, coaches, or other commercial vehicles with crews for the carriage of passengers.

Trade in fisheries products	Fishery products entering (imports) or leaving (exports) an economic territory. Goods simply being transported through a country (goods in transit) or temporarily admitted or withdrawn (except for goods for inward or outward processing) do not add to or subtract from the stock of material resources of a country and are not included in the international merchandise trade statistics. Fisheries products are classified according to the International Merchandise Trade Statistics, Concepts and Definitions manual.

Data source

The immediate source of all data presented here is the OECD *Sustainable Ocean Economy Database*, a synthetic database that brings relevant datasets from across the OECD and partner organisations together in a single place:

OECD, "Sustainable Ocean Economy", *OECD Environment Statistics* (database), *https://stats.oecd.org/index.aspx?datasetcode=OCEAN*

Original sources include:

- International Energy Agency (IEA): *CO_2 Emissions from Fuel Combustion*, *Detailed Country RD&D Budgets*
- International Transport Forum (ITF): *Freight Transport*
- OECD *Environment Statistics* (Biodiversity, Land cover change, Protected areas, Environmentally related tax revenue, Innovation in environment-related technologies).
- OECD *Fisheries Statistics* (Marine landings, Production from aquaculture, Employment in fisheries, Fishing fleet, Trade in products)
- OECD *Green Growth Indicators*
- OECD *International Trade in Services Statistics*
- OECD *Inventory of Support Measures for Fossil Fuels*
- OECD *Policy Instruments for the Environment (PINE) Database*.

References and further reading

Carpenter, K.E. et al. (2008), “One-third of reef-building corals face elevated extinction risk from climate change and local impacts”, *Science*, Vol. 321/5888, *http://doi.org/10.1126/science.1159196*.

Dureuil, M. et al. (2018), “Elevated trawling inside protected areas undermines conservation outcomes in a global fishing hot spot”, *Science*, Vol. 362/6421, *https://doi.org/10.1126/science.aau0561*.

Halpern, B.S. et al. (2017), “Drivers and implications of change in global ocean health over the past five years”, *PloS one*, Vol. 12/7, *https://doi.org/10.1371/journal.pone.0178267*.

Haščič, I. and M. Migotto (2015), "Measuring environmental innovation using patent data", *OECD Environment Working Papers*, No. 89, OECD Publishing, Paris, *https://doi.org/10.1787/5js009kf48xw-en*.

IEA (2018), *Energy Technology RD&D Budgets 2018: Overview*, IEA, Paris, *www.iea.org/statistics/rdd*.

ITF (2019), *ITF Transport Outlook 2019*, OECD Publishing, Paris, *https://doi.org/10.1787/transp_outlook-en-2019-en*.

IUCN (2019), *The IUCN Red List of Threatened Species*, Version 2019-2, *www.iucnredlist.org*.

OECD (2020), *OECD Tourism Trends and Policies 2020*, OECD Publishing, Paris, *https://doi.org/10.1787/6b47b985-en*.

OECD (2020), *Policy Instruments for the Environment (PINE)* database, December 2019 edition, *www.oecd.org/environment/indicators-modelling-outlooks/policy-instrument-database*.

OECD (2019), *Inventory of Fossil Fuel Support Measures, www.oecd.org/fossil-fuels*.

OECD (2019), *Responding to Rising Seas: OECD Country Approaches to Tackling Coastal Risks*, OECD Publishing, Paris. *https://doi.org/10.1787/9789264312487-en*.

OECD (2019), *Rethinking Innovation for a Sustainable Ocean Economy*, OECD Publishing, Paris, *https://doi.org/10.1787/9789264311053-en*.

OECD (2019), *Revenue Statistics 2019*, OECD Publishing, Paris, *https://doi.org/10.1787/0bbc27da-en*.

OECD (2018), *OECD Companion to the Inventory of Support Measures for Fossil Fuels 2018*, OECD Publishing, Paris, *https://doi.org/10.1787/9789264286061-en*.

OECD (2017a), *Marine Protected Areas: Economics, Management and Effective Policy Mixes*, OECD Publishing, Paris, *https://doi.org/10.1787/9789264276208-en*.

OECD (2017b), *Green Growth Indicators 2017*, OECD Green Growth Studies, OECD Publishing, Paris, *https://doi.org/10.1787/9789264268586-en*.

OECD (2017c), *OECD Review of Fisheries: Policies and Summary Statistics 2017*, OECD Publishing, Paris, *https://doi.org/10.1787/rev_fish_stat_en-2017-en*.

OECD (2016), *The Ocean Economy in 2030*, OECD Publishing, Paris, *https://doi.org/10.1787/9789264251724-en*.

OECD (2011), *Invention and Transfer of Environmental Technologies*, OECD Studies on Environmental Innovation, OECD Publishing, Paris, *https://doi.org/10.1787/9789264115620-en*.

Worm, B. et al. (2006), Impacts of biodiversity loss on ocean ecosystem services. *Science*, Vol. 314/5800, *http://doi.org/10.1126/science.1132294*.

WWF (2015), *Living Blue Planet Report. Species, habitats and human well-being*, Tanzer, J. et al. (eds), WWF, Gland, Switzerland,

www.wwf.or.jp/activities/data/20150831LBPT.pdf.

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Metadata, Legal and Rights

https://doi.org/10.1787/ac4b8b89-en