Facts and figures: the EMTER report

EMSA
European Maritime Safety Agency

European Environment Agency

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In brief

- In 2018, emissions from the maritime transport sector made up 13.5% of the EU's total transport greenhouse gas emissions; well behind road transport (71%) and slightly behind aviation (14.4%). Over one third of this came from container ships.

- Approximately 40% of the EU population lives within 50 kilometres of the sea, so air emissions from ships are a particular concern for coastal communities. In common with other forms of transport, ships emit substances including sulphur oxides (SOX), nitrogen oxides (NOX) and particulate matter (PM), which can affect human health. In 2018, the maritime transport sector produced 24% of all NOx emissions, 24% of all SOx emissions and 9% of all PM2.5 emissions, as a proportion of national EU emissions from all economic sectors.

- Underwater noise caused by ships' engines and propellers can cause hearing loss and create behavioural changes in marine animals. Estimates suggest that, between 2014–2019, the total accumulated underwater radiated noise more than doubled in EU waters.

- Non-indigenous species can invade new habitats by clinging to the hulls of ships as they move from port to port, or via ship ballast water, which is taken on in one port and released in the ship's destination. The maritime transport sector accounts for the largest proportion of the introduction of non-indigenous species in seas around the EU (51 high-impact species; almost 50% of the total) since 1949.

- Even though the amount of oil transported by sea has been steadily growing for the last 30 years, the total amount of accidental oil spills has been constantly declining. During 2010-2019, out of 44 medium size oil spills across the world, only five were located in European seas. Out of a total of 18 large oil spills across the world, only three happened in the EU.

- Lost containers are a source of marine litter. Depending on the sea conditions at the time they were lost, they can remain intact in the water, or release part – or all – of their content. The percentage of total waste released through lost containers at sea is low and considered negligible in the EU, with an average of 268 containers lost per year out of 226 million containers shipped worldwide.

- The EU has a comprehensive package of rules addressing the environmental aspects of maritime transport, many of which go beyond agreed international standards. However, future challenges for policymakers include a projected increase in global shipping, as well as climate change, which could see ports vulnerable to rising sea levels, and new permanent shipping lanes in areas where they are currently not open all year round.

The EU fleet

In 2019, ships registered to EU Member State flags (approximately 18 000 ships) made up almost one fifth of the total world fleet in dead weight tonnage (DWT), a measure for cargo carrying capacity. More than 80% of these ships are bulk carriers, oil tankers, and container ships.

The EU Member State-registered fleet is relatively modern; half of all ships registered to EU Member State flags are less than 15 years old, and therefore more likely to meet higher environmental standards.

In 2019, almost half of maritime traffic (ship calls) in the EU came from vessels engaged exclusively in domestic routes and voyages, mainly due to the frequent crossings made by roll-on roll-off passenger ships and ferries. EU ports handled close to four billion tonnes of goods, accounting for around half of all goods by weight traded between the EU-27 and the rest of the world.

EU and international environmental standards for maritime transport:

Since the late 1990s, the EU has adopted an increasingly comprehensive body of rules which applies to ships trading in EU waters or sailing to or from EU ports. These laws, among others, address environmental aspects like air emissions, such as the Regulation on the Monitoring, Reporting and Verification of CO_2 or the Sulphur Directive, and water pollution aspects such as the Ship Source Pollution Directive and the Port Reception Facilities Directive. In addition, the Marine Strategy Framework Directive, the Water Framework Directive and the Habitats Directive, protect the marine environment, aiming to uphold good environmental status standards and to reduce air and other pollution in coastal communities and ports.

These EU laws are coherent with the international framework, and some go beyond the environmental standards set by the International Maritime Organization.

The International Maritime Organization (IMO), has, since its foundation, adopted more than 50 international treaties regulating international shipping, of which 40% focus on environmental protection.
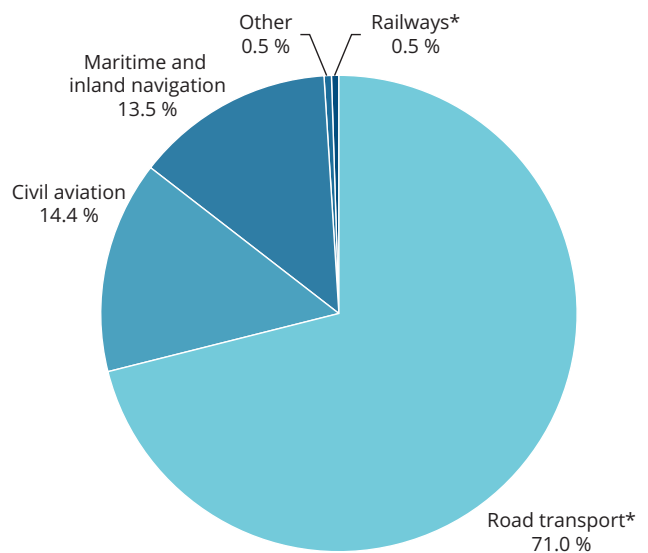
Greenhouse gases:

The EU has proposed an EU-wide net greenhouse gas emissions (GHG) reduction target by 2030 of at least 55% (compared to 1990) that will set the Union onto the path to climate neutrality.

In 2018, the maritime transport and inland navigation sector contributed 13.5% of the EU's total transport greenhouse gas emissions; well behind road transport and slightly behind aviation.

By far the largest type of greenhouse gas emissions created by the maritime transport sector was carbon dioxide (CO_2) from the burning of fuel. In total, ships calling at EU and EEA ports generated 140 million tonnes of CO_2 emissions in 2018 (approximately 18% of all CO_2 emissions generated by maritime transport worldwide that year).

Of the total CO_2 emissions, around 40% arise from ships travelling between ports of EU Member States and ships at berth in ports. The remaining 60% is produced during voyages into and out of the EU. Container ships alone account for around one third of the fleet CO_2 emissions in the EU.

**Greenhouse gas emissions all transport sectors**

Other
0.5 %

Railways*
0.5 %

Maritime and inland navigation
13.5 %

Civil aviation
14.4 %

Road transport*
71.0 %

Note: *excluding indirect emissions from electronic consumption.

Source: 'EEA greenhouse gas — data viewer', European Environment Agency (https://www.eea.europa.eu/data-andmaps/data/data-viewers/greenhouse-gases-viewer)

Air pollution:

Approximately 40% of the EU population lives within 50 kilometres of the sea, so air emissions from ships are a particular concern for coastal communities. Ships emit substances, including sulphur oxides (SOX), nitrogen oxides (NOX) and particulate matter (PM), which can affect human health. These emissions can be significant in areas of heavy maritime traffic.

In 2018, the maritime transport sector produced 24% of all NOx emissions, 24% of all SOx emissions and 9% of all PM2.5 emissions (particle matter emissions with a diameter of less than 2.5μm), as a proportion of national EU emissions from all economic sectors:
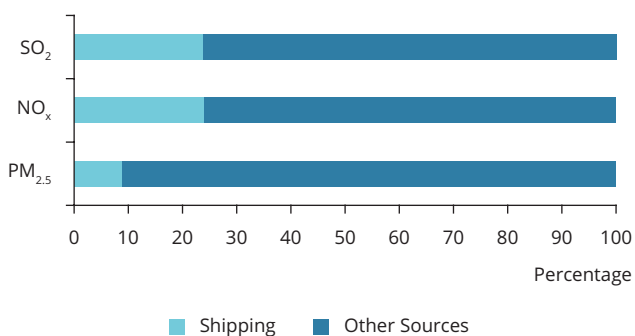
Note: SO_2, sulphur dioxide.

Source: 'Air pollutant emissions data viewer (Gothenbur Protocol, LRTAP Convention) 1990-2018', European Environment Agency (https://www.eea.europa.eu/data-andmaps/dashboards/air-pollutant-emissions-data-viewer-3).

The main sulphur oxides emissions from ships are sulphur dioxides (SO2). These emissions are generated by the use of marine fuels in engines on board vessels, but also by other combustion machinery, like oil-fired boilers. In 2019, SO2 emissions from ships calling in EU/European Economic Area (EEA) ports amounted to around 1.63 million tonnes; approximately 16% of the global SO2 emissions from international shipping.

To reduce SO2 emissions from ships, the sulphur content of marine fuels has been regulated in the EU since 1999, and continuously reduced since then, with the EU Sulphur Directive leading to reductions in SOx concentrations in European seas. In addition, in 2015, sulphur emission control areas (SECAs) were introduced in the North and Baltic Seas, requiring ships to use fuels with a maximum sulphur content of 0.10% m/m in these areas. The SECAs have proven to effectively contribute to a significant reduction in SO2 concentrations, reaching attenuations of up to 60%.

As of January 2021, NOx Emission Control Areas have been applied in the North Sea and the Baltic Sea, although effective reductions are expected to materialise at a slow pace as the requirements only apply to new ships.

Underwater noise:

Ships create noise as they pass through the water, from their propellers, machinery (including their engines) and from the movement of their hulls. This noise can affect marine species in different ways; loss of hearing, reduction in communication, a potential increase in stress levels, and various behavioural changes are just some adverse effects on marine life caused by underwater noise. Cetaceans (dolphins, porpoises and whales) are thought to be particularly affected, as they use sound to communicate between each other.

It is estimated that between 2014 and 2019, the total accumulated underwater radiated noise more than doubled in EU waters. Container ships, passenger ships, and tankers generate the highest noise emissions from propeller use.

Currently, underwater noise thresholds are being developed for the EU under the Marine Strategy Framework Directive.

Non-indigenous species:

Non-indigenous species are aquatic pathogens, which can be transported from one habitat to another by ships either externally (by clinging to the hulls of vessels, otherwise known as hull fouling) or through ships' ballast water, which is fresh or salt water held in tanks to stabilize vessels and increase manoeuvrability. If these species adapt to their new environment, they can create a threat to local biodiversity, human health and severely damage local economies.

Overall, since 1949, the maritime transport sector has accounted for the largest proportion of non-indigenous species introduced into seas around the EU – close to 50% of all species, with the largest number found in the Mediterranean. 51 species are all classified as high impact, meaning that they can affect ecosystems and native species.

However, the rate of new introductions has slowed down since 2005, due to a combination of factors including increased awareness, the decreasing pool of potential non-indigenous species, effective policies, and new legislation.

Oil pollution:

Over the past 30 years, the amount of oil transported at sea has been steadily growing. However, the number of oil spills has been in decline. Between 2010 and 2019, out of 44 medium-sized oil spills (defined as spills of between 7-700 tonnes of oil), only five were located in European seas. During the same period, only three large oil spills (involving more than 700 tonnes of oil) out of a total of 18 such spills, were located in the EU.

The trend is the same for smaller oil spills of less than 7 tonnes. In 2019, a total of 7 939 possible such spills were identified via satellite monitoring in EU waters, with 42% confirmed as discharges of various sizes. However, despite an increase in the area covered by satellites, the average number of detections per million km2 has decreased, confirming a positive declining trend in discharges.

Marine litter:

Marine litter can endanger fish and animals living in the oceans. It can also damage ships and cause accidents at sea, and impacts coastal communities when it washes up on shore.

One of the ways in which litter reaches the marine ecosystem is through lost containers at sea, which can either split open, discharging their contents, or can remain intact, causing a hazard for other ships. However, estimates suggest that the percentage of total waste released through lost containers at sea is negligible in the EU, with an average of 268 containers lost per year (i.e. one thousandth of 1% of 226 million packed and empty containers worldwide shipped on average annually).

Another way in which litter enters the oceans is through waste generated on-board ships. When vessels arrive at port, they unload the waste they produce at sea, in what are termed port reception facilities. In 2018, a comparison between the amount of expected ship-generated waste and the waste that was actually delivered in port reception facilities in the EU provided an estimate of the amount of potential ship generated waste which could be illegally discharged at sea. This estimate ranged from around 2.5% for oily waste, 10% for sewage and 7–34% for refuse (excluding plastic waste).

To tackle this discrepancy, the Directive regulating the availability of Port Reception Facilities and the delivery of waste to those facilities was revised in 2019, with the aim of substantially reducing discharges of ship-generated waste and cargo residues into the sea.

Navigating towards sustainability:

Efforts have also focused on increasing energy efficiency, with data revealing that most ships calling in the EU have reduced their speed up to approximately 20% compared to 2008, thereby also reducing emissions. In addition, non-traditional fuels and energy sources, such as biofuels, batteries, hydrogen or ammonia are emerging as possible alternatives for shipping, with the potential to decarbonise the sector and lead to zero emissions.

The use of liquefied natural gas (LNG) as ship fuel can substantially reduce the release of air pollutants like sulphur oxide (SOx; a reduction of up to 90%), particulate matter (PM; a reduction of up to 90%) and nitrogen oxides (NOx; a reduction of up to 80%) compared to traditional fossil fuels. In 2020, a

total of 59 ports in the EU had LNG installations, totalling 71 facilities.

Ships can also avail of onshore power supplies (OPS), which provide a clean source of energy, in maritime and inland navigation ports, where air quality is poor, or noise levels are high. In the EU, 9.60% of container ships, 15% of cruise ships and 10% of Ro-pax ships calling at ports are equipped with high-voltage OPS. 31 ports from 12 EU Member States have already implemented high-voltage shore connection (36 shore-to-ship power supply facilities in total in the EU).

Improved ship design and operation can contribute to reducing greenhouse gas emissions from ships. In 2018, the technical energy efficiency of ships calling in EU/European Economic Area ports was generally comparable to that of the world fleet (except for small container ships). Most ships built after 2015 already comply with energy efficiency standards applicable over the period 2020-2025S

Future trends:

Over the coming decades, international shipping is expected to grow. Transport volume for all ship categories is expected to increase by 24% by 2050, and world trade is predicted to grow by 9% between 2030 and 2050.

In addition, the International Maritime Organization (IMO) has estimated that the maritime sector's greenhouse gas emissions will increase to about 90-130% of 2008 emissions by 2050 for a range of plausible long-term economic and energy scenarios.

Sulphur oxides (SOX) and particulate matter (PM) emissions from shipping are projected to drop substantially up to 2050. Nevertheless, sea-based source nitrogen oxides emissions are expected to increase, which, combined with a projected decrease in land-based source emissions, means that maritime nitrogen oxides (NOX) emissions will exceed land-based emissions after 2030.

Climate change will have a major impact on the maritime transport sector. Port infrastructure will need to adjust to expected sea level rises due to climate change, and the melting of the earth's ice cap could fully open new routes, including the Northern Sea Route and the Northwest Passage.

With nearly a fifth of the total world fleet, the EU faces a crucial decade in which it needs to lead the transition to a more economically, socially and environmentally sustainable maritime transport sector. The implementation of the European Green Deal's objectives, together with those of the 2030 Biodiversity Strategy, the Sustainable and Smart Mobility Strategy, the proposed European Climate Law, the Farm to Fork Strategy and the Zero Pollution Action Plan, will inevitably move towards a reduction in the consumption of petroleum as well as a reduction in the waste shipped out of the EU.

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European Maritime Safety Agency
Praça de Europa 4, Cais do Sodré
1249-206 Lisboa
Portugal
Tel.: +351 21 1209 200
Internet: emsa.europa.eu
Enquiries: emsa.europa.eu/contact

European Environment Agency
Kongens Nytorv 6
1050 Copenhagen K
Denmark
Tel.: +45 33 36 71 00
Web: eea.europa.eu
Enquiries: eea.europa.eu/enquiries