

**Annex B: Greenhouse Gas (GHG) Emissions from Maritime Transport for Global Air emissions
Accounts (AEAs)**
Area C Report to 15th UNCEEA

Purpose: To produce, based on existing data sources, calculations of greenhouse gas (GHG) emission estimates from maritime transport that are suitable as an input to the initiative to develop global air emissions accounts (AEAs) according to the System of Environmental-Economic Accounts 2012 Central Framework (SEEA). The SEEA Central Framework is an international standard for integration of economic and environmental statistics and the goal with respect to emissions from transport is to link the emissions with economic activities, particularly transportation services and trade.

Context/requirements: The emissions from maritime transport would complement the existing [databases](#) of air emissions accounts, led by the OECD. The OECD's work on air emission accounts is part of global initiative directed by the UN Committee of Expert on Environmental-Economic Accounting (UNCEEA) to create a centralized hub for accessing global environmental-economic accounts databases: <https://seea.un.org/content/data>.

This initiative for maritime transport follows from previous work conducted in collaboration with the International Civil Aviation Organisation (ICAO) on CO₂ emissions from air transport. The aim for this initiative on maritime transport emission is to likewise develop a mutually beneficial collaboration with the International Maritime Organisation (IMO) to integrate statistics on emissions from maritime transport. The OECD is also seeking to collaborate and share information with the European Commission, and its members, which are producing calculations of emissions from maritime transport in the European Economic Area. For the purposes of development of global SEEA databases, we are seeking a global coverage.

GHG emissions from marine transport, and their reduction, has been a topic of study in recent years by the OECD Environment Directorate and the International Transport Forum (ITF). The ITF has published multiple Policy Insights on emissions from maritime transport, and a [Report on Decarbonising Maritime Transport¹](#), in 2018, which examines the requirements underpinning the global ambition under the UN International Maritime Organisation (IMO) "Initial GHG Strategy" to decarbonise maritime shipping by 2035. The ITF Report includes projections of possible future emissions from maritime shipping up until 2035 according to various scenarios.

The European Commission created, in 2013, a [Strategy²](#) for reducing GHGs from maritime transport. The European Commission Regulation 2016/2071 requires all large ships over 5,000 gross tonnage loading or unloading cargo or passengers in the European Economic Area (EEA) to monitor and report related CO₂ emissions. On 30 June 2019, the Commission [published](#) for the first time information collected from this monitoring and reporting scheme. 2018 data for EEA can be downloaded (.xls format) from that site including information on fuel consumption and CO₂ emissions.

Globally, in 2018, the UN's International Maritime Organization's Marine Environment Protection Committee (MPEC) adopted a [strategy](#) for GHGs reduction, which includes a mandatory data reporting system on fuel use by vessels that went into effect on January 1st, 2019. The reporting requirement applies globally for ships of 5,000 gross tonnage and above. The country of the ship's

¹ <https://www.itf-oecd.org/decarbonising-maritime-transport-2035>

² https://ec.europa.eu/clima/policies/transport/shipping_en

flag reports aggregated data to the IMO, which shall produce an annual summary report to the IMO Marine Environment Protection Committee. The IMO strategy's objective is to reduce total annual GHG emissions from shipping by at least 50% by 2050 compared to 2008 levels.

The IMO is working on its Fourth IMO GHG Study Report, with expected public release later this year. Previously, IMO produced the [Third IMO GHG Study in 2014](#). The Third IMO GHG Study was prepared by a Consortium of organizations from 9 countries. The Third IMO Study includes bottom-up calculations of statistics on CO₂ emissions from shipping. The Report estimates that, on average, maritime shipping constitutes 3.1% of global CO₂ emissions and 2.8% of all GHGs emissions. The study provides estimates for multi-year (2007-2012) tonnes of emissions for CO₂, CH₄ and N₂O, NO_x (as NO₂) and SO_x (as SO₂) from shipping.

The IMO study estimates emissions from bottom-up and top-down approaches for comparison. The bottom up approach is based on analysis of calculations of activity, fuel consumption (per engine) and emissions (per GHG and pollutant substances) for each in-service ship during each hour. The top-down approach was developed for verification purposes and is based on IEA energy statistics, particularly marine transport fuel bunkers. The IMO Reports present main findings from the calculations of emissions but there is no public database for accessing the statistics.

Relevance of Emissions from International Transport and Accounting: The transportation sector is obviously a major component and driving force of economic activity and thus an important part of national accounting for economic activity. International transportation has additional importance for accounting because economic activity is recorded in the national accounts according to residence of the producers of goods and services (known as the residence principle), whereas currently air emissions accounts are estimated on a territory basis (i.e. the geographic location of the activity). Thus, further development of national statistics on emissions from domestic and international transportation will be instrumental to unlocking the potential to produce air emission accounts both on a territory and on an economic residence basis.

Current challenges: Maritime transport comes in many forms with a broad range of shipping vessel types. In principle, the objective should be to cover emissions from all types of marine transport, initially focussing on vessels with 5,000 gross tonnage and above. According to documentation of previous studies from IMO, such estimates are possible from existing data sources, especially ship registry data (e.g. IHS or IHSF data) and ship tracking (Automatic Identification System, AIS). As mentioned, the European Commission and its members have already produced these statistics for the EU for 2018 but further testing of methodology for attribution of emissions to countries based on available data with global coverage is needed.

Accessing Data

The first step is to access data from existing international data sources, including the newly established data collection at IMO, mentioned above. The European Commission published key statistics from its monitoring and reporting scheme, but currently this data is available for one year (2018) and covers ports in the EEA only.

The Third IMO GHG Study found that data for characterizing shipping activity improved compared to previous studies. Further research should analyse if and how the quality and accessibility of data for producing statistics on emissions outside of EEA may have improved yet further, or at least could be accessed by the OECD to produce estimates of good quality in time series.

One of the main sources of uncertainty of estimates using the bottom-up methodology according to the Third IMO GHG Study, was the number of days at sea for shipping vessels, because the AIS data

had incomplete coverage. The IMO study mentions some other uncertainties or limitations from the existing data, e.g. for disaggregating between domestic and international shipping, but overall the Report cites improvements in the quality of data over time.

Expertise on Maritime Data

Fortunately, the IMO study provides extensive documentation of the methodology used, especially for the bottom-up approach, including key assumptions and key data sources. However, a process of compiling samples of the relevant data and testing replicability of the IMO methodology is required. It is not yet clear whether AIS (ship tracking) and ship registry data can be accessed without a fee. Further, the IMO study used matching techniques to merge across multiple ship tracking and registration data, which may be difficult to replicate without experience with these data.

Input from and/or close co-operation with experts having prior experience with the data and methods, for example members of the Consortium that prepared the Third IMO GHG Study and experts from the European Commission, would be extremely useful, including at the initial stage of feasibility assessment. Maritime terminologies used in the IMO reports are explained comprehensively, but different organisations or data sources may have different use of terms. Furthermore, formats (file types) and policies for data exchange will vary.

Coverage of Emissions (types of gases)

CO₂ emissions are by far the dominant source of contributors to global warming potential from maritime shipping. But there are other GHG emissions and also air pollutants (NO_x, SO_x, PM), particularly in coastal zones from shipping, which require different measurement methodologies. Thus, the study should review whether a practical first step for the project should be a prioritized focus on CO₂, similar to the approach by the European Commission.

Attribution of Emissions to Countries

As with other components of air emissions accounts, the aim would be to attribute emissions from maritime transport to a national economy, so that the information can be linked to output and value added (GDP) as recorded in the countries' system of national accounts. This would allow calculating emissions intensity/industry productivity metrics which would contribute to monitoring sustainability, e.g. via OECD's Sustainable Ocean Economy Database.³

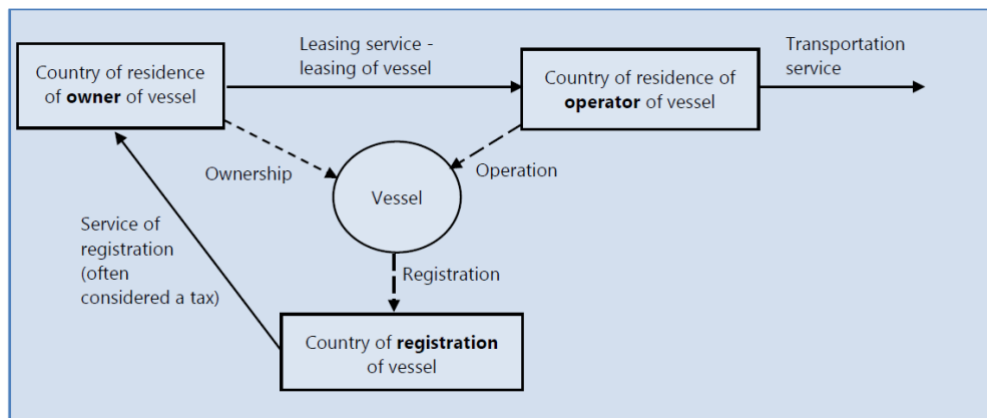
As discussed in the UNECE Guide to Measuring Global Production (UNECE, 2015), there are some inherent challenges to attribute statistics on maritime transport to a single country in a consistent and meaningful way. None the less, maritime transportation services are incorporated into national accounts and compilation of GDP and the goal for compilation of emissions in AEAs is to attribute emissions from these activities to national economies in essentially the same way.

As discussed in the UNECE Guide to Measuring Global Production (UNECE, 2015), there are some inherent challenges to attribute statistics on maritime transport to a single country in a consistent and meaningful way. For example, the country that purchased a ship could be different from the country where the shipping operation is registered and different from the countries of either the origin or destination locations of the shipping operation.

From a national accounts perspective, the aim of attribution is to identify the country of main economic interest for the producer of the *transportation service* – which is the relevant productive activity in this case. According to UNECE (2015), the company engaged in operating the transportation service is often different from the ship's owner (see Figure below). Further research

³ <http://oe.cd/ds/oceandat>

will be pursued using international datasets. However initial discussions with experts from other agencies working on this issue (e.g. Statistics Netherlands) suggests that establishing a robust link between attribution of emissions and attribution of maritime transportation services is feasible based on administrative data on operation of vessels.



Source: figure 8.5 *The multinational organization marine transport*, from UNECE 2015