

Agenda Item 3

Overview of MARPOL Annex VI & NO_x Technical Code

Part 1

Regional Expert Meeting on the Possible Designation of the Mediterranean, as a whole, as a Nitrogen Oxides Emission Control Area (Med NO_x ECA),
Malta, 18 to 19 November 2025



**Mediterranean
Action Plan**
Barcelona
Convention



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November 2025

Content of this presentation



Agenda item 3

Overview of MARPOL Annex VI & NO_x Technical Code Part 1

- **Why** regulate air pollution from ships
- **Current status** of MARPOL Annex VI and its application
- MARPOL Annex VI: **Chapter 1** General and **Chapter 2** Survey and certification

The background of the slide features a series of overlapping, wavy bands in various shades of blue, ranging from a deep navy to a lighter, muted blue. These bands flow from the top right towards the bottom left, creating a sense of movement and depth. The bottom left corner is a solid white space where the text is located.

Why regulate air pollution from ships

Different types of air emissions

“Air emissions” include two categories:

- **Air pollutants:** **harmful** substances for human beings impacting **air quality**:
 - **NO_x** (Nitrogen Oxides), **SO_x** (Sulphur Oxides) and **Particulate Matters** (PM) or Black Carbon (BC).
- **Other emissions** which **alter the climate system** as they introduce changes to the earth's atmosphere (climate forcers):
 - **Greenhouse gases** (GHG), such as **carbon dioxide** (CO₂) or **methane** (CH₄) and ozone-depleting substances (ODS) contribute to **global warming**.

It is generally considered that **air pollutants** have **localized** impacts while **greenhouse gas emissions** and ozone-depleting substances have **global** impacts.

Air pollution from ships

Main shipboard sources of emissions (covered by MARPOL Annex VI):

- **SO_x and PM**
- **NO_x**
- **CO₂**
- **ODS**
- **VOC (tankers only)**

Not directly covered by Annex VI

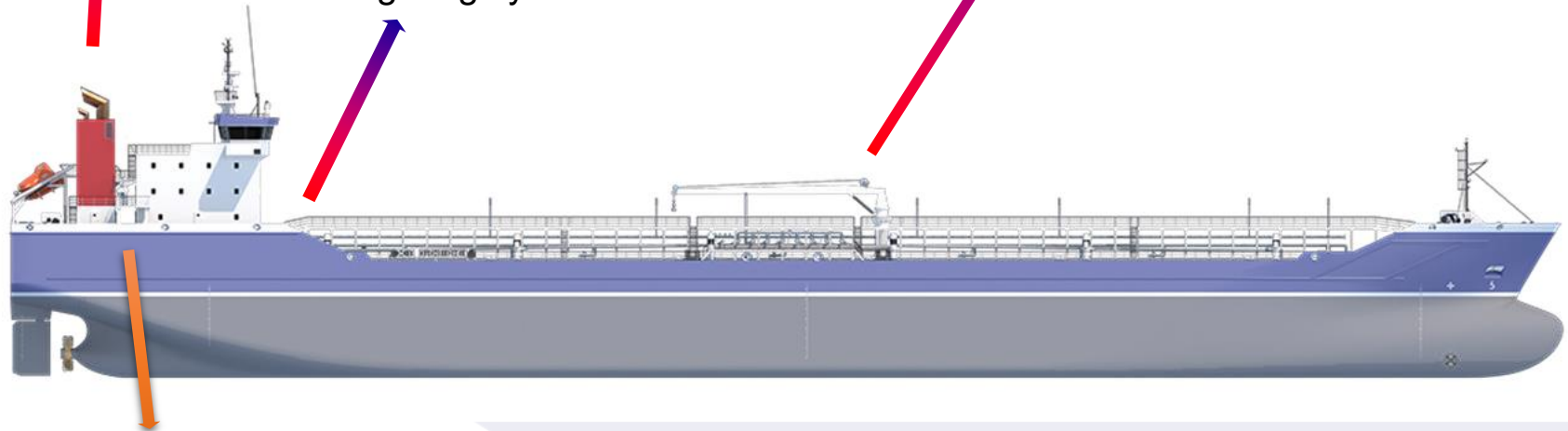
- ⇒ **other gases** such as nitrous oxide N₂O, carbon monoxide CO and CH₄ (methane slip)
- ⇒ **Black carbon BC** (a type of PM)

SO_x, Particulate Matters PM, NO_x, CO₂
in exhaust gases from:

- main and auxiliary engines
- boilers
- incinerators

Volatile organic compounds
from cargoes onboard tankers

Ozone-depleting substances
(gases) from refrigeration or fire-fighting systems



Accidental release

Shipboard sources of air pollution under MARPOL Annex VI

Air emissions covered by MARPOL Annex VI

	Shipboard sources and formation
Nitrogen Oxides NO_x Regulation 13	Internal combustion engines NO_x are combustion products, generated in high temperature spots, by a reaction between the atmospheric nitrogen and oxygen. The amount of NO_x emitted by an engine is primarily a function of the combustion temperature ⇒ Higher combustion temperature results in more NO_x. NO_x emissions can be abated with primary and/or secondary methods. ❑ Primary methods aim at reducing the formation of NO_x in the engine, by altering the engine design, or using methods such as exhaust gas recirculation (EGR) or water injection. ❑ Secondary methods consist in treating the exhaust gases after the engine, using selective catalytic reduction (SCR).

Air emissions covered by MARPOL Annex VI

	Shipboard sources and formation
Sulphur Oxides SO_x Regulation 14	Internal combustion engines and boilers; Inert gas generators using fuel The combustion of fuels containing sulphur produces SO_x emitted in the exhaust gas. The amount of SO_x released is directly linked to the sulphur content of the fuel. All the sulphur contained in the fuel changes to SO₂ or SO₃. SO_x emissions may be reduced with exhaust gas cleaning systems (EGCS, i.e. scrubbers) fitted to the engine.
Particulate Matter PM Regulation 14	Internal combustion engines and boilers; Inert gas generators using fuel PM are products of a non-complete combustion process. The formation of PM depends on the efficiency and completeness of the combustion process, and other parameters such as the amount of hydrocarbons, ash and sulphur in the fuel. Because of its link with sulphur, PM and SO_x emissions are often grouped together. The PM level generally increases with the fuel sulphur content. Thus, reduction of fuel sulphur will reduce SO_x but also PM.

Air emissions covered by MARPOL Annex VI



Shipboard sources and formation

Refrigeration systems and fire-fighting equipment or systems

Chlorofluorocarbons **CFC** // Hydrochlorofluorocarbons **HCFCs**

CFCs are found in **older systems** used for refrigeration of cargo or air conditioning; and in portable and fixed fire-fighting systems. Some insulation foams may contain CFCs.

HCFCs were introduced as an **intermediate replacement for CFCs**.

Emissions are primarily **fugitive emissions from refrigerant and air conditioning systems**. Recharging operations may lead to **non deliberate** emissions.

While the phasing **out of ODS is already effective**, systems or equipment containing ODS may still be found onboard existing ships and may be recharged as necessary.

Onboard older vessels, **HCFCs** (such as R-22) are still in service, whereas **new vessels use HFCs** (such as R134a/R404a).

Ozone-Depleting Substances
ODSs
Regulation 12

Group

CFC

HCFC

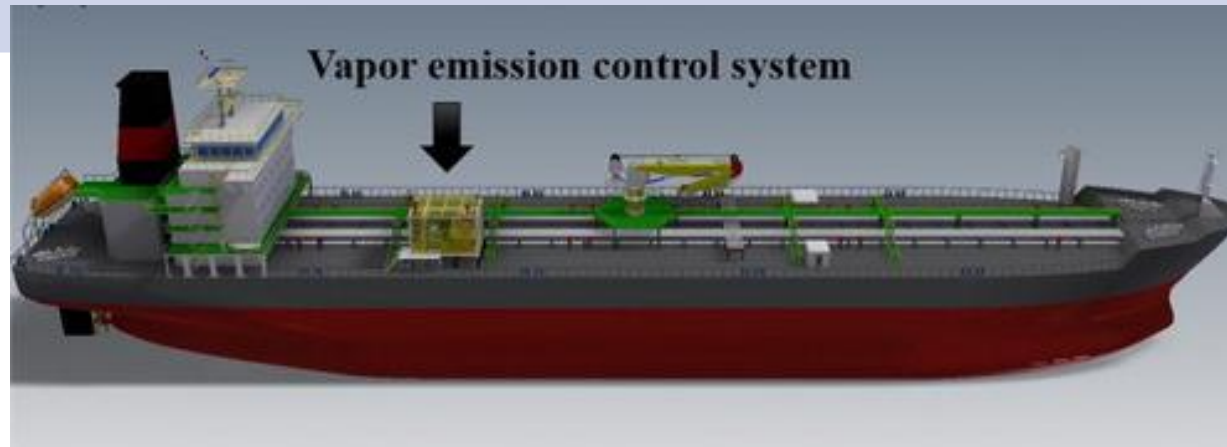
HFC

Refrigerants	ODP	GWP at 100
R11	1	3800
R12	1	8100
R113	0.8	4800
R114	1	9000
R115	0.6	9000
R22	0.055	1500
R123	0.02	90
R124	0.022	470
R141b	0.11	630
R142b	0.065	2000
R23	0	11700
R32	0	650
R125	0	2800
R134a	0	1300
R143a	0	3800
R152A	0	140

ODP and GWP collected on CFC, HCFC and HFC.
Source: ScienceDirect, Anthony Ademola Adeyanju

Air emissions covered by MARPOL Annex VI

	Shipboard sources and formation
Volatile Organic Compounds VOCs Regulation 15	Hydrocarbon cargoes onboard oil tankers or chemical tankers; gas carriers VOCs are a mixture of light hydrocarbons, such as methane or ethane, propane or butane (non-methane volatile organic compounds are referred to as NMVOC). They are released by evaporation from liquid bulk cargoes at ambient temperature and pressure. On crude-oil tankers, they form when the cargo evaporates, which occurs during loading, storage and transportation. VOC emissions also incur a loss of cargo.



Source: *Journal of Marine Engineering & Technology*, Vol. 20, 2021 - Issue 4

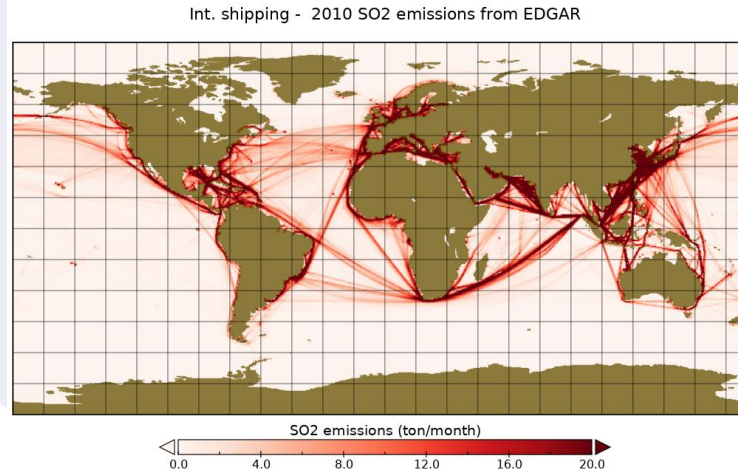
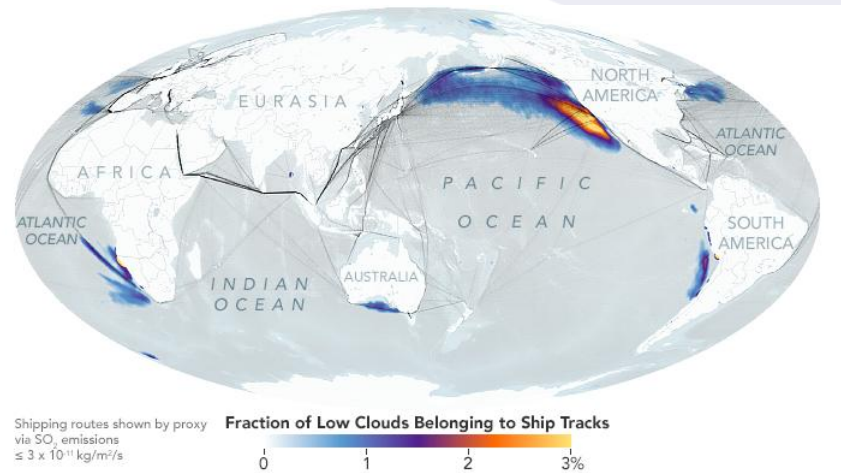
Air emissions covered by MARPOL Annex VI

	Shipboard sources and formation
CO₂ Chapter 4	Internal combustion engines and boilers CO ₂ is a by-product of the combustion of hydrocarbon fuels. The quantity of CO ₂ released is calculated based on the carbon content of the fuel consumed. The quantity emitted by a ship is directly linked to its fuel consumption.
OTHER Black Carbon BC	Internal combustion engines and boilers Black Carbon is not a gas but a type of particulate matter. BC is NOT directly covered MARPOL Annex VI. Rather, several MEPC resolutions address the threat to the Arctic posed by BC through guidance of voluntary nature. <i>(resolution MEPC.342(77) Protecting the Arctic from Shipping Black Carbon Emissions; MEPC.394(82) Guidelines on recommendatory Black Carbon emission measurement, monitoring and reporting)</i>

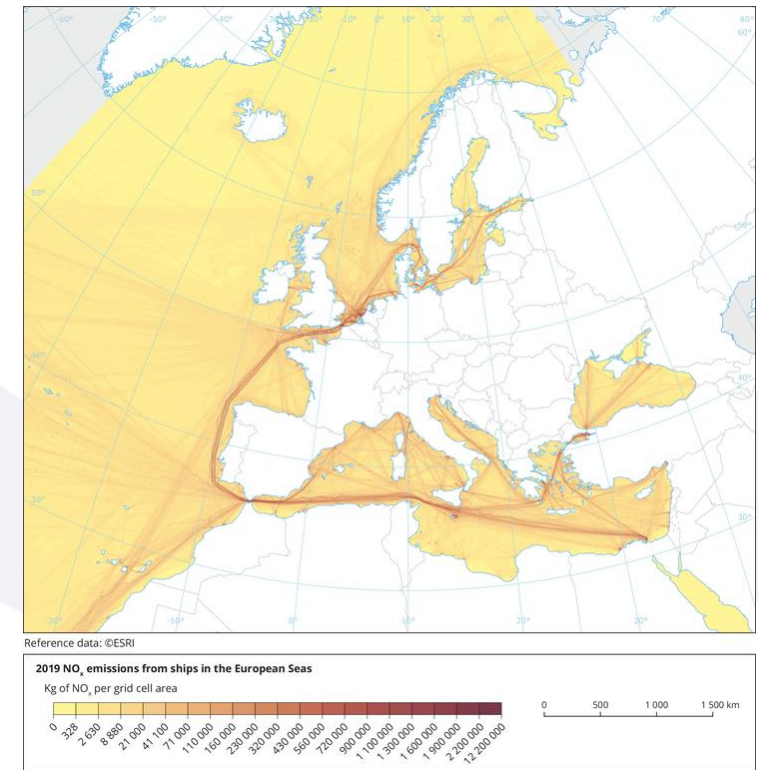
Air pollution from ships

A well-known and documented issue

- Examples of data available for: NO_x, SO_x, ship clouds



Sulphur dioxide emissions above international shipping routes in 2010. Source: EUMETSAT



This map reports the NO_x emissions from ships in sea areas of the EU (calculated as NO₂) during the year 2019
Source: The European Environment Agency. Map (static) Published 01 Sept 2021, modified 20 Sept 2024

Satellites that can track global emissions at a country level. “Ship track” clouds 2003 to 2020, Source: NASA Earth Observatory

Why regulate?

Shipping emissions require regulations:

- “de facto” as a **human-related activity** that generates emissions
- because shipping trade **grows** on a yearly basis

Shipping today – the basic facts

Around **80% of the volume of international trade** in goods is carried by sea. The percentage is even higher for most developing countries.

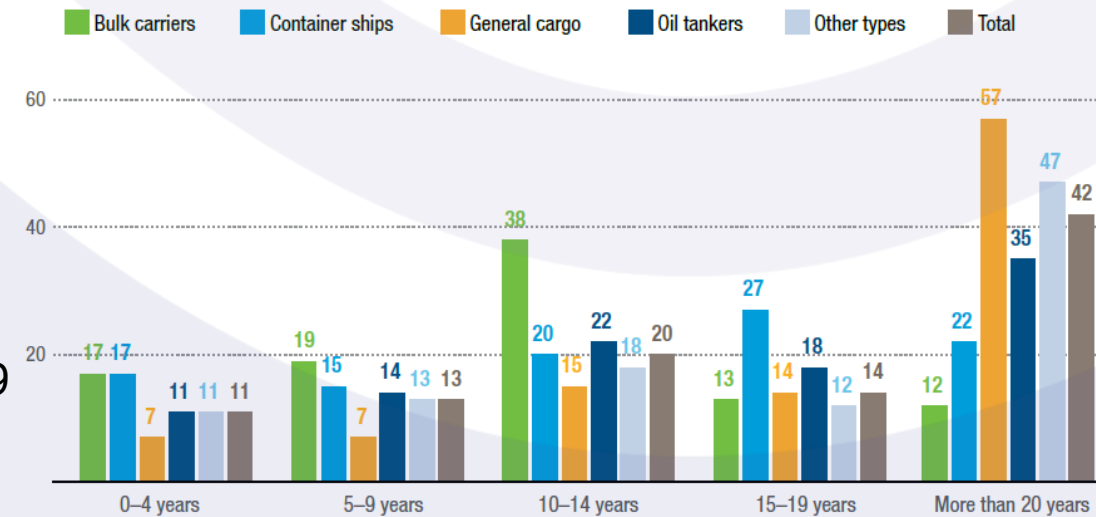
- Global maritime trade grew by **around 2%** in 2023 and 2024, recovering from a 2022 contraction
- Total seaborne trade **will grow on average by 2.4%** in 2025–2029
- The global shipping fleet is **ageing**, with many ships soon due to reach the end of their service-life.
- Age of the global fleet by deadweight tonnage (Feb.2024) = 12.5 years.
 - But age by **vessel counts averaged 22.4 years**.

(Source: UN Trade and Development UNCTAD Review of maritime transport 2024)



Figure II. 5

Average age of world fleet, percentage number of vessels, 2024



Source: UNCTAD calculations, based on data provided by Clarksons Research Services.

Note: Propelled seagoing vessels of 100 gross tons and above, as of 1 January 2024.

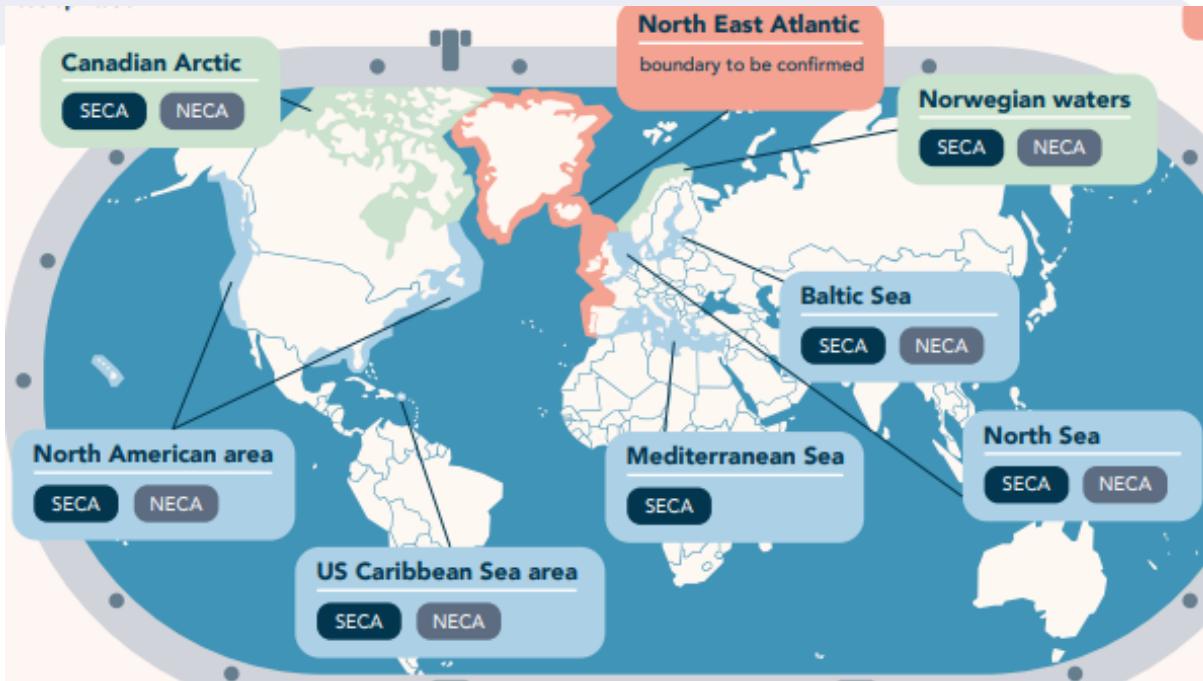
Average age of world fleet, by ship type

Source: UNCTAD Review of maritime transport 2024

How to regulate?

2 main solutions in MARPOL: **Special Areas** (control area) and **Ban** on some substances

Emission Control Areas



Infographic Source: Cleanarctic

Carriage Ban

- No **CFC** or **halon** containing system or equipment on ships constructed > 2005, and similarly, for HCFC on ships constructed > 2020
- Carriage ban on **HFO** used as fuel (unless scrubber is used)



Status of MARPOL Annex VI

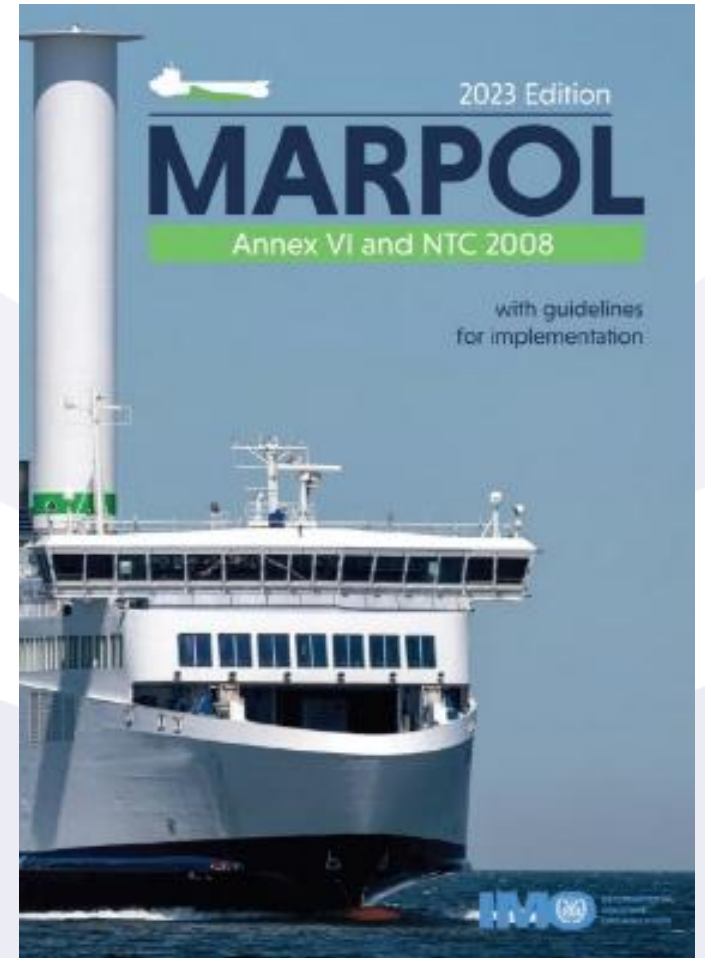
Ratification of MARPOL Annex VI

The Air Pollution Conference adopted the **Protocol of 1997** to amend the MARPOL Convention:

- a new **Annex VI** entitled “*Regulations for the Prevention of Air Pollution from Ships*”

The 1997 Protocol (= MARPOL Annex VI) entered into force on **19 May 2005**.

- By July 2025, **108** State Parties
- **> 97%** of the tonnage of the world’s merchant fleet
- A State becomes a Party by **accession** to MARPOL Annex VI (accession to MARPOL Convention required)



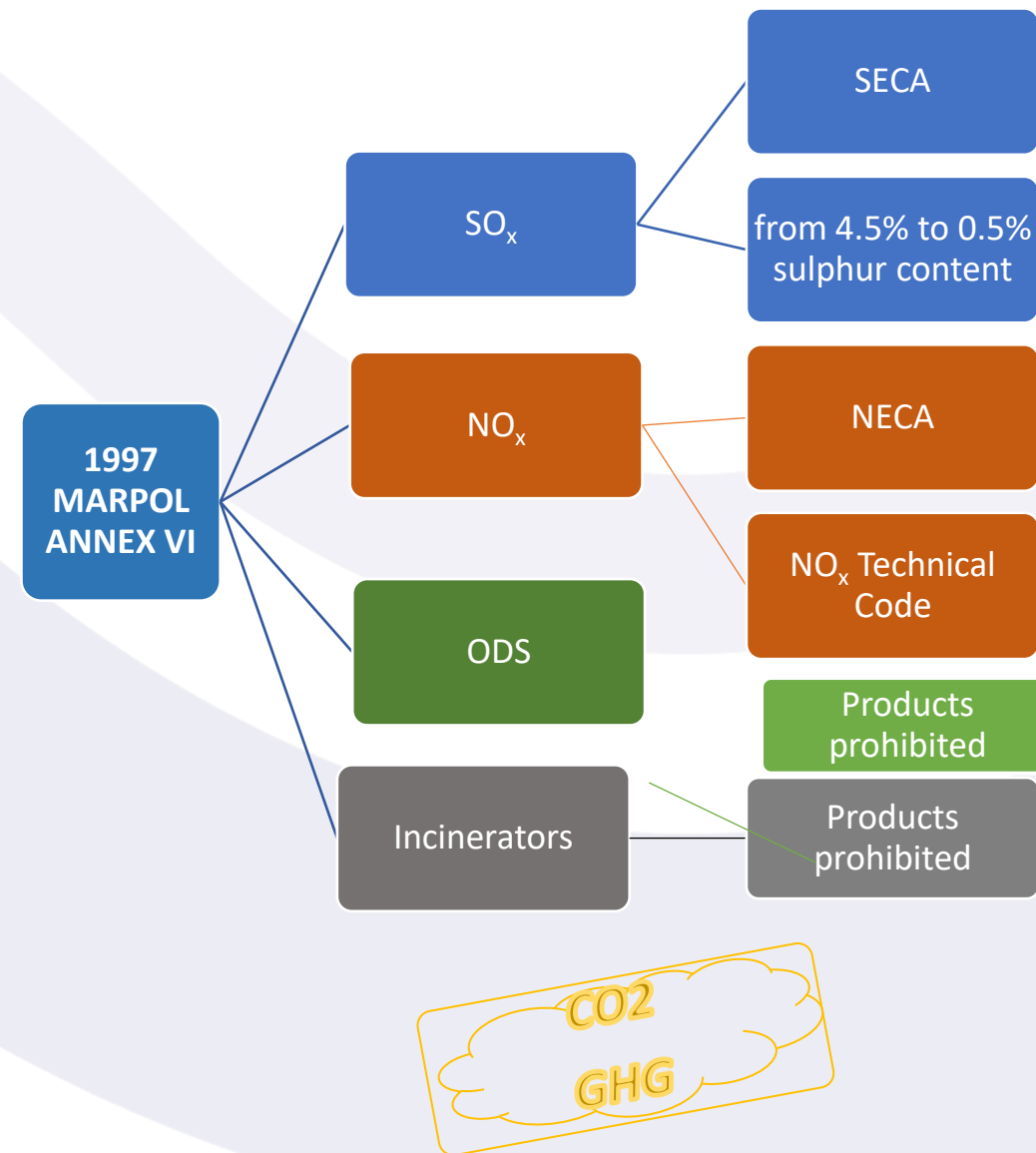
MARPOL Annex VI – Summary

Foundations of MARPOL Annex VI

- A set of **regulations** designed pre-2000 and regularly amended and strengthened by MEPC (Resolutions)
- Two main axis:
 - improving **air quality** (air pollutants)
 - **climate action** (reducing GHGs)
- Over the years, **more stringent** limits for air pollutants

Enforcement

Set of actions taken by States in their capacities as flag, coastal and port States.





MARPOL Annex VI

Chapter 1 General

Chapter 2 Survey and Certification

Chapter 1 of MARPOL Annex VI

Chapter 1 - General

Application

Definitions

Exceptions and exemptions

Equivalents

Reg.1

Reg.2

Reg.3

Reg.4

Chapter 1 – General

Regulation 1 - Application

As in many IMO instruments, the sentence “***apply to all ships except where expressly provided otherwise in regulations of this Annex***” indicates that, as a principle:

- MARPOL Annex VI applies to **all categories of seagoing ships** (on international voyages)
- but **exceptions** may be specified in the text of each regulation

Annex VI - Application

All Ships

Except

- **Exceptions and exemptions** set in reg. 3
 - In case of serious damage
 - Saving life at sea
 - Securing safety of ship
 - Ship trials for research
 - Emissions from seabed mineral activities
 - Unmanned non-self-propelled barges
- Certain **ship types and sizes**, as specified

Chapter 1 – General

Regulation 2 – Definitions

More than 60 definitions, split in two parts:

- **General** definitions
- Definitions for the purpose of **chapter 4** (carbon intensity of ships)

Each **ship type** is defined, with **14** categories (Passenger ship, Refrigerated cargo carrier, Ro-ro cargo ship (vehicle carrier, Ro-ro passenger ship, Tanker, etc...)).

Examples

- **Fuel oil** means any fuel delivered to and intended for combustion ... incl. gas, distillate and residual fuels
- **Emission control area** means an area where the adoption of special mandatory measures ... is required to control NO_x or SO_x and particulate matter or all three types of emissions
- **Marine diesel engine** means any reciprocating internal combustion engine operating on liquid or dual fuel.

Chapter 1 – General

Regulation 3 – Exceptions and Exemptions

It describes the different **circumstances** where emissions are **not** regulated by MARPOL Annex VI:

- **Emergency at sea**: in **exceptional circumstances** such as those resulting from securing the safety of the ship or saving life at sea, or from damage suffered by the ship or its equipment.
- **Trial purposes**: Exemptions given by Administrations for ships conducting trials for the **development of ship emission reduction and control technologies** and engine design programmes.
- **Seabed mineral activities**: exemptions are applicable to emissions **directly arising from seabed mineral activities**; and specifically for hydrocarbons produced and used on a production site as fuel (exemption from reg. 18 on fuel oil quality)

Chapter 1 – General

Regulation 3 – Exceptions and Exemptions

It also contains a specific exemption for **unmanned non-self-propelled (UNSP) barges**:

- the Administration may exempt UNSP barges from the **survey and certification requirements** set in regs. 5 and 6
- A specific International Air Pollution Prevention Exemption **Certificate for UNSP Barges** is issued



Image credit: sta_bki; @bki_sta, X

Chapter 1 – General

Regulation 4 – Equivalentents

This regulation explains the **approval process for alternative equipment or compliance methods**

- used onboard a ship to **achieve emissions reductions at least as effective as those required** under Annex VI
- subject to the **approval by the Administration**, and
- taking into account **relevant guidelines developed by IMO**.

⇒ for **regulation 14 on SO_x**:

⇒ **exhaust gas cleaning systems** (EGCS, aka “scrubbers”)

⇒ For **Incinerators** covered by **reg. 16**:

⇒ **When** replaced by thermal waste treatment devices (TWTD).

Information on equivalentents approved by Administrations shall be communicated to IMO for circulation.

This is done through the IMO “**GISIS**”, module on MARPOL A



Ship and Company Particulars

Search the world fleet of ships by IMO Number and look up company particulars by IMO Company Number.

Contact Points

Contact lists of competent authorities and authorized organizations relating to IMO matters.

Marine Casualties and Incidents

Data on marine casualties and incidents, as defined by circulars MSC-MEPC.3/Circ.3.

Pollution Prevention Equipment and Anti-fouling Systems

Equipment required by MARPOL 73/78 and the BWM Convention, and anti-fouling systems compliant with the AFS Convention.

Piracy and Armed Robbery

Reported incidents of piracy and armed robbery.

Non-mandatory Instruments

Comprehensive list of non-mandatory IMO instruments.

Global SAR Plan

Information on the availability of Search and Rescue (SAR) Services.

Cargoes

Information received from IMO members relating to containers, grain and solid bulk cargoes and dangerous goods in packaged form.

National Maritime Legislation

Texts of national laws, orders, decrees, regulations and other instruments implementing IMO conventions.

Crew Change and Repatriation of Seafarers

Crew Change and Repatriation of Seafarers.

Maritime Security

Information communicated under the provisions of SOLAS regulation XI-2/13 (SOLAS chapter XI-2 and the ISPS Code).

Recognized Organizations

Information submitted by Member States under MSC/Circ.1010-MEPC/Circ.382.

Port Reception Facilities

Data on the available port reception facilities for the reception of ship-generated waste.

Status of Treaties

Status of ratification of IMO conventions.

Facilitation of International Maritime Traffic

Information on stowaway incidents, E-Addresses of Governmental Authorities and notifications pursuant to article VIII of the FAL Convention.

Simulators

Information on simulators available for use in maritime training.

Condition Assessment Scheme

Electronic database for the implementation of the Condition Assessment Scheme - Resolution MEPC.94 (46), as amended.

GMDSS

Global Maritime Distress and Safety System (GMDSS)

Test Laboratories and Halon Facilities

Test laboratories recognized by administrations and halon banking and reception facilities

MARPOL Annex VI

Notifications communicated under the provisions of MARPOL Annex VI (Regulations for the Prevention of Air Pollution from Ships)

Public Home > MARPOL Annex VI

Reg. 4.2 Reg. 11.4 Reg. 13.7.1 Reg. 15.2 Regs. 17.2 Regs. 17.3 Reg. 18.1 Reg. 18.2.5 Reg. 18.9.6 Reg. 19.6 Specimens

MARPOL Annex VI

In 1997 a new annex was added to the International Convention for the Prevention of Pollution from Ships (MARPOL). The Regulations for the Prevention of Air Pollution from Ships (Annex VI) seek to minimize airborne emissions from ships (SOx, NOx, ODS, VOC) and their contribution to global air pollution and environmental problems. Annex VI entered into force on 19 May 2005 and a revised Annex VI was adopted in October 2008 which entered into force on 1 July 2010.

Administrations are required to make notifications to the Organization under the following regulations of MARPOL Annex VI:

- [Regulation 4.2](#): equivalent compliance method;
- [Regulation 11.4](#): detection of violations and enforcement;
- [Regulation 13.7.1](#): approved methods for certain marine diesel engines installed on a ship constructed prior to 1 January 2000;
- [Regulation 15.2](#): ports or terminals regulating the emissions of Volatile Organic Compounds (VOCs);
- [Regulations 17.2](#): ports, terminals or ship-breaking facilities where reception facilities are available;
- [Regulations 17.3](#): ports, terminals or ship-breaking facilities where reception facilities are alleged to be inadequate;
- [Regulation 18.1](#): fuel oil availability;
- [Regulation 18.2.5](#): evidence of non-availability of compliant fuel oil;
- [Regulation 18.9.6](#): failure of fuel oil suppliers to meet the requirements specified in regulation 14 or 18 of Annex VI;
- [Regulation 19.6](#): allowance, suspension, withdrawal or declination of application of regulation 19.4 of Annex VI;
- [Regulation 19.6](#): allowance, suspension, withdrawal or declination of application of regulation 19.4 of Annex VI and;
- [Specimens](#): specimens of certificates.

The **Global Integrated Shipping Information System** is developed and maintained by IMO Secretariat. The website/database allows access to information supplied to the IMO by Administrations (and ROs).

GISIS is composed of several sub-systems, as modules covering various topics.



MARPOL Annex VI

Chapter 2 – Survey, Certification and Means of Control

Chapter 2 of MARPOL Annex VI

Chapter 2 - Survey, Certification and Means of Control

Surveys

Issue or endorsement of certificates

Reg.5

Issue of a certificate by another Party

Reg.6

Form of certificates

Reg.7

Duration and validity of certificates

Reg.8

Port state control and operational requirements

Reg.9

Detection of violations and enforcement

Reg.10

Reg.11

Chapter 2 – Survey, certification and means of control

Regulations 5 and 6 – Surveys and Certification

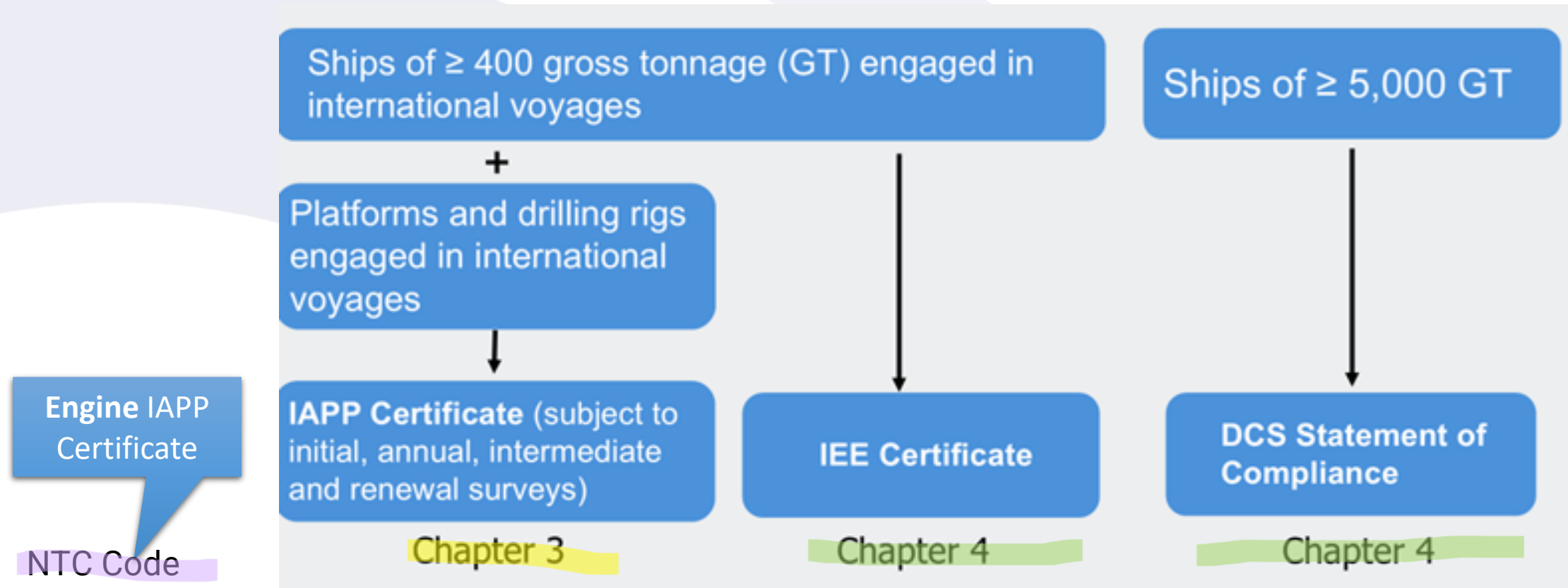
Regulation 5 lays down the **survey regime**: the different **ship statutory surveys** to ensure compliance with MARPOL Annex VI. Also covers the Ship Energy Efficiency Management Plan **SEEMP**.

Regulation 6 details the certificates issued upon completion of said surveys:

- International Air Pollution Prevention (**IAPP**) Certificate
- International Energy Efficiency (**IEE**) Certificate

Reg.6 also covers the **Statement of Compliance**, issued annually for the reporting and verification of data on the ship **fuel oil consumption** (IMO DCS) and the **carbon intensity rating** (CII).

Chapter 2 – Summary



+ For ships < 400 GT, the Administration may establish measures to comply with provisions of chapter 3.

Chapter 2– Survey, certification and means of control

Regulations 8 – Form of Certificates

Model forms provided in Appendixes to MARPOL Annex VI:

- **IAPP** Certificate and its Supplement
- **IEE** Certificate
- **IAPP Exemption Certificate** for Unmanned Non-self-propelled Barges
- **Statement of Compliance** related to FO consumption reporting and operational CII rating

Administration and their ROs may add their ensigns, symbols, etc., however the certificates and statements **shall correspond to the models** given in Appendixes.

NB: the model for the EIAPP Certificate is given in the NTC, 2008.

Chapter 2– Survey, certification and means of control

Regulation 9 – Duration and Validity of Certificates

It complements regulation 6 (Issue of Certificates or Statements) to clarify **validity periods for the IAPP and IEE Certificates** (and the DSC Statement of compliance).

Extension of validity in special circumstances

- For the ship to **reach the port** where the survey is planned: **3-month extension**
- Ships on **short voyages**: **1-month period of grace**

Transfer of flag

- **re-issuance** of certificates, if the new flag State is satisfied that the ship is in compliance

Chapter 2 – Survey, certification and means of control

Regulations 10 – Port State control on operational requirements

It reinstates that rights and obligations of a **Party carrying out control over operational requirements shall not be limited** and strengthens the frame for PSC inspections related to MARPOL Annex VI.

It recalls that any PSC inspection may verify compliance with **chapter 4** of MARPOL Annex VI by checking the presence onboard and validity of the:

- ✓ **Statement of compliance** related to FO consumption reporting and operational CII
- ✓ **IEE Certificate**
- ✓ **SEEMP**

End of Agenda Item 3: Overview of MARPOL Annex VI & NO_x Technical Code - Part 1



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