

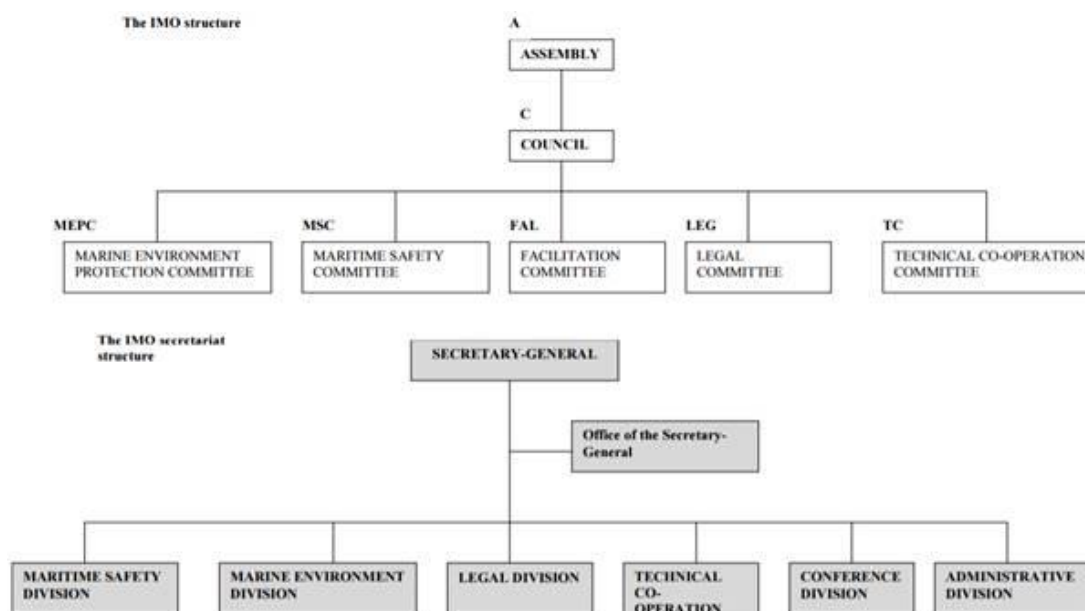
CHAPTER 1

PART 2 - ENVIRONMENTAL CONCERNS AND IMO RESPONSE

1.1 Summary

There are several international rules to govern international shipping, in this section will review the regulatory frameworks developed by IMO, that have to do with the impact shipping has on the environment and the subsequent climate change, in order to address this issue. There are two organizations that together develop regulatory frameworks. Those are the IMO and UNCLOS, that have to do with the regulations of international shipping and international law regarding sea respectively. The UNCLOS has a plethora of references to the protection of the environment. Some of the most important articles are about the State responsibility for protecting the environment.

The chart below (Figure 3) depicts IMO and its secretariat structures (Ziarati et al, MariFuture, Development Papers 2018-2019)¹.



¹ See for instance the 35th Development Paper published in July 2019 - http://www.marifuture.org/Reports/Development-Papers/ADP_07_2019_MARIFUTURE.pdf

1.1.1 IMO Response: maritime Environmental Regulatory Framework

International shipping is guided by international regulatory and legal frameworks. These Frameworks are defined to understand the shipping impact on climate change and the marine related worldwide regulations to address the consequences of air emissions can be found in the UNCLOS and IMO MARPOL regulations. The UNCLOS regulations make the basis of the international law regulating seas, while the IMO specifically involves in regulating shipping. They both develop regulatory regimes to be enforced by States. (IMO.org 2016)

1.1.2 UNCLOS (United Nations Convention on the Law of Sea) Regulations and Environment

“The UNCLOS possesses extensive references to the protection of the environment. The UNCLOS recalls the importance to: “Promote the peaceful uses of the seas and oceans, the equitable and efficient utilization of their resources, the conservation of their living resources, and the study, protection and preservation of the marine environment”. (Nordqvist 1995, 1-400.)

A complete part of the material is dedicated to the protection of the environment. Part XII reflects the main objectives of the UN in terms of environmental protection which occurred in parallel to the extensive negotiations to develop the UNCLOS. The most significant articles demonstrating the importance of the State responsibility in order to environment protection are presented below:

Article 192: General obligation

“States have the obligation to protect and preserve the marine environment”. (Nordqvist 1995, 1-400.)

Article 194:

“Measures to prevent, reduce and control pollution of the marine environment.

States Shall take all measures necessary to ensure that activities under their jurisdiction or control are so conducted as not to cause damage by pollution to other States and their environment, and that pollution arising from incidents or activities under their jurisdiction or

control does not spread beyond the areas where they exercise sovereign rights in accordance with this convention”. (Nordqvist 1995, 1-400.)

Article 195: “Duty not to transfer damage or hazards or transform one type of pollution into another. In taking measures to prevent, reduce and control pollution of the marine environment, States shall act so as not to transfer, directly or indirectly, damage or hazards from one area to another or transform one type of pollution into another”. (Nordqvist 1995, 1-400.)

Article 197:” Cooperation on a global or regional basis States shall cooperate on a global basis, and as appropriate, on a regional basis, directly or through competent international organizations, in formulating and elaborating international rules, standards and recommended practices and procedures consistent with this convention, for the protection and preservation of the marine environment, taking into account characteristic regional features”. (Nordqvist 1995, 1-400.)

Article 204: “Monitoring of the risks or effects of pollution

- States shall, consistent with the rights of other States, endeavour, as far as practicable, directly or through the competent international organizations, to observe, measure, evaluate and analyze, by recognized scientific methods, the risks or effects of pollution of the marine environment.
- In particular, States shall keep under surveillance the effects of any activities which they permit or in which they engage in order to determine whether these activities are likely to pollute the marine environment.” (Nordqvist 1995, 1-400.)

Article 212: “Pollution from and through the atmosphere

- States shall adopt laws and regulations to prevent, reduce and control pollution of the marine environment from or through the atmosphere, applicable to the air space under their sovereignty and to the vessels flying their flag or vessels or aircraft of their

registry, taking into account internationally agreed rules, standards and recommended practices and procedures and the safety of air navigation.

- States shall take other measures as may be necessary to prevent, reduce and control such pollution.
- States, acting especially through competent international organizations or diplomatic conference, shall endeavour to establish global and regional rules, standards and recommended practices and procedures to prevent, reduce and control such pollution". (Nordqvist 1995, 1-400.)

In addition, many articles deal with the enforcement by flag State (Article 217), Port State (Article 218) and Coastal State (Article 220).

UNCLOS recalls:

- The States duties to protect the environment and responsibility not to harm others.
- The measures developed should not transfer the damage or risks.
- The global and regional cooperation are paramount in environmental protection.
- The risks and effects of pollution must be assessed scientifically.
- The air pollution is an established concern.
- Compliance Monitoring and Enforcement systems have to be developed to verify the compliance of the activities.

UNCLOS demonstrates the how important it is to protect the environment and to develop proper enforcement mechanisms which can be used through certification and inspection regimes (Nordqvist 1995, 1-400).

1.1.3 Overview of the IMO structure

In 1948, a UN body in charge of maritime affairs was created. The International Maritime Organization (IMO) acquired its final name in 1982. The IMO presently consists of an Assembly, a Council, a number of Committees and a Secretariat. The structures of the IMO and its secretariat can be simplified as shown in figure below:

Figure 1: IMO and its secretariat structures (Ziarati et al, MariFuture, Development Papers 2018-2019).

The aim of IMO marine environment division is to control marine pollution from ships. For environmental point of view the IMO have to support the enforcement of highest practical standards and also maintain a close relations with other UN bodies on such matters. IMO provides required tools and policies but the enforcement and implementation of these tools falls in the hand of member States and their governments (Ziarati et al, MariFuture, Development Papers 2018-2019).

1.1.4 IMO commitment to environmental protection

From 1959, the IMO has actively taken responsibility to issues caused and related by pollution by marine industry. The Organization is playing a key part in supporting the development of regulations to prevent marine pollution and introduces technologies and specifics as defined by the UNCLOS:

- Article 1. “(4) *“pollution of the marine environment” means the introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuary, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities;*” (UNCLOS: A Commentary 1995, 53).
- Article 196 *“States shall take all measures necessary to prevent, reduce and control pollution of the marine environment resulting from the use of technologies under their jurisdiction or control, or the intentional or accidental introduction of species, alien or new, to a particular part of the marine environment, which may cause significant and harmful changes thereto.”* (UNCLOS: A Commentary 1995, 75)

Maritime Environment Protection Committee (MEPC) is the IMO committee in charge of addressing the environmental issues for the IMO. This Committee is supported by Sub-Committees sometimes shared with the Maritime Safety Committee. Also, the MEPC sets up

working groups that deal with various items of its agenda (e.g. ballast water, air pollution, GHG emissions, etc.). The Committees and its working groups are supported by the IMO Secretariat that deals with all related administrative aspects.

The MEPC may issue circulars and resolutions as well as draft resolutions to be adopted by the Assembly. The MEPC meets three times over two years (twice 1st year and once second year). During the MEPC sessions, various working groups or correspondence groups may be established to address particular issues. All States represented at the IMO may participate to discuss the issues related to pollution prevention and control as well as industry representatives and NGOs (Non-Governmental Organisations). Decisions are normally reached through consensus but if there is a need for voting, only Parties to relevant Convention (e.g. MARPOL Annex VI, Ballast Water Management) are eligible to cast their votes.

The IMO's Marine Environment Division supports the MEPC and deals on a daily basis with relevant environmental issues but above all supports the working of MEPC and other IMO divisions in related areas. Today, the IMO regulations cover the whole ship's pollution risks as presented in figure below. Specifically, IMO deals with the following Conventions:

- **MARPOL Convention** Dealing with various types of pollutants.
- **Anti-Fouling System Convention**, entered into force in 2008, prohibits the use of harmful organotin compounds in anti-fouling paints used on ships and establishes a mechanism to prevent the potential future use of other harmful substances in anti-fouling systems. Antifouling systems to be prohibited or controlled are listed in the Convention.
- **Ballast Water Management Convention** entitled "International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM)" (IMO 2004). Was adopted in 2004 and awaits at this point in time (2015) ratification by enough member states. It aims to prevent the spread of harmful aquatic organisms from one region to another, by establishing standards and procedures for the management and control of ships' ballast water and sediments.

- **Hong Kong Convention** entitled “International Convention for the Safe and Environmentally Sound Recycling of Ships” (IMO 2009). was adopted in 2009 and awaits at this point in time (2015) ratification by enough member states. It aims at ensuring that ships, when being recycled after reaching the end of their operational lives; do not pose any unnecessary risk to human health and safety or to the environment.

London Convention entitled the "Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972" (IMO 1972) deals primarily with dumping waste into marine environment and has been in force since 1975. Its objective is to promote the effective control of all sources of marine pollution and to take all practicable steps to prevent pollution of the sea by dumping of wastes and other matter. The IMO Conventions relating to the prevention of marine pollution relating to ship operations is presented as follows. (Ziarati et al, MariFuture, Development Papers 2018-2019).



As stated above, the latest Conventions adopted but not yet entered into force are the International Convention for the Control and Management of Ships’ Ballast Water and Sediments, 2004, and the Hong Kong International Convention for the Safe and

Environmentally Sound Recycling of Ships, 2009. The 1973 International Convention for the Prevention of Pollution from Ships (MARPOL) integrated the issue concerning the air pollution by ships in the Convention's adoption of the 1997 Protocol creating the MARPOL Annex VI. The IMO and its member States recognize the importance of the environmental protection which became over the years a major item of concern for the Organization.

the IMO shows a strong willingness to address the issue of the climate change by promoting innovative regulations in the framework of the UN discussion on GHG emissions. This disposition has been demonstrated through the adoption of various instruments during MEPC 62 in 2011 and the intensive discussions on developing further technical and operational measures such as data collection system for ships as part of wider MRV (Monitoring, Reporting and Verification) debate.

while taking part in the Climate Change debate at the UN, IMO will proceed in parallel with its own programme of work (Ziarati et al, MariFuture, Development Papers 2018-2019).

1.1.5 Marpol Convention

“The International Convention for the Prevention of Pollution from Ships (MARPOL) is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes.

The MARPOL Convention was adopted on 2 November 1973 at IMO. The Protocol of 1978 was adopted in response to a spate of tanker accidents in 1976-1977. As the 1973 MARPOL Convention had not yet entered into force, the 1978 MARPOL Protocol absorbed the parent Convention. The combined instrument entered into force on 2 October 1983. In 1997, a Protocol was adopted to amend the Convention and a new Annex VI was added which entered into force on 19 May 2005. MARPOL has been updated by amendments through the years.

The Convention includes regulations aimed at preventing and minimizing pollution from ships - both accidental pollution and that from routine operations - and currently includes six

technical Annexes. Special Areas with strict controls on operational discharges are included in most Annexes.

Annex I - Regulations for the Prevention of Pollution by Oil (entered into force 2 October 1983): Covers prevention of pollution by oil from operational measures as well as from accidental discharges. The 1992 amendments to Annex I made it mandatory for new oil tankers to have double hulls and brought in a phase-in schedule for existing tankers to fit double hulls.

Annex II - Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk (entered into force 2 October 1983): Details the discharge criteria and measures for the control of pollution by noxious liquid substances carried in bulk; some 250 substances were evaluated and included in the list appended to the Convention; the discharge of their residues is allowed only to reception facilities until certain concentrations and conditions.

Annex III - Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form (entered into force 1 July 1992): Contains general requirements for the issuing of detailed standards on packing, marking, labelling, documentation, stowage, quantity limitations, exceptions and notifications. For the purpose of this Annex, the “harmful substances” are fully defined.

Annex IV - Prevention of Pollution by Sewage from Ships (entered into force 27 September 2003): Contains requirements to control pollution of the sea by sewage; the prohibition of discharge of sewage into the sea, approved sewage treatment plant, etc. with lots of details on the subject.

Annex V - Prevention of Pollution by Garbage from Ships (entered into force 31 December 1988): Deals with different types of garbage and specifies the distances from land and the manner in which they may be disposed of; the most important feature of the Annex is the complete ban imposed on the disposal into the sea of all forms of plastics.

Annex VI - Prevention of Air Pollution from Ships (entered into force 19 May 2005): Sets limits on sulphur oxide (SO_x) and nitrogen oxide (NO_x) emissions from ship exhausts and prohibits deliberate emissions of ozone depleting substances; sets designated Emission

Control Areas with more stringent standards for SO_x and NO_x. A new chapter adopted in 2011 covers mandatory technical and operational energy efficiency measures aimed at reducing GHG emissions from ships. A State to become a Party to MARPOL must ratify MARPOL Annexes I and II. The rest of Annexes are voluntary as far as membership to MARPOL Convention is concerned” (IMO 2005).

1.1.6 Marpol Annex VI

MARPOL Annex VI is the latest added part to MARPOL Convention in 1997 that entered into force in 2005. Major modifications / amendments to MARPOL Annex VI occurred in 2008 on NO_x Technical Code and 2011 with the insertion of a new Chapter 4 which deals with energy efficiency regulations for ships (effectively dealing with GHG emissions).

Therefore, today, the Annex VI encompasses air pollutants and GHG emissions combined. The regulations include also elements like bunker fuels, incinerators, reception facilities, Emission Control Areas, Ozone Depleting Substances, etc. The scope of MARPOL Annex VI is depicted in figure below.

MARPOL Annex VI Chapter 1 – General: Introduces some of the basics of the Convention as well as certain useful definitions. Under this chapter, the following regulations are fully specified:

- Regulation 1 – Applications: This specifies the application domain of MARPOL Annex VI.
- Regulation 2 – Definitions: This provides definitions for terms that have regulatory significance.
- Regulation 3 - Exceptions and exemptions: This regulation describes the conditions under which a ship or a marine platform could be exempted from complying with MARPOL Annex VI.
- Regulation 4 – Equivalent: This allows the use of alternative method of compliance and the conditions under which they will be acceptable.

MARPOL Annex VI Chapter 2 – Survey, certification and means of control: describe the survey requirements, certification system and control principles including port State control issues and violation detection and enforcement. Under this chapter, the following regulations are fully specified:

- Regulation 5 - Surveys: This regulation describes the survey and inspection requirements.
- Regulation 6 - Issue of endorsement of certificate: The rules for issuance of certificates, forms of certificates, etc. are specified under this regulation.
- Regulation 7 - Issue of a certificate by another party: This regulation allows another Party to issue a certificate on behalf of a Party.
- Regulation 8 - Form of certificates: The forms of various certificates are specified here.
- Regulation 9 - Duration and validity of certificates: The duration and validity certificates are discussed under this regulation.
- Regulation 10 - Port State control and operational requirements: The port State control aspects and relevant rules are explained in this regulation.
- Regulation 11 - Detection of violation and enforcement: Specific aspects under which a ship could be detained are described under this regulation.

MARPOL Annex VI Chapter 3– Requirements for control of emissions from ships: this chapter details the measures to address various air pollutants and important related issues as bunker management and incinerator. Under this chapter, the following regulations are fully specified:

- Regulation 12 –Ozone-depleting substances (ODSs): This regulation prohibits deliberate release of ODSs and sets timeline for phasing out of certain ODSs.

- Regulation 13 – Nitrogen oxides (NO_x): This part of the Annex regulates the NO_x emissions by ship for engines installed on ships constructed after 2000. Three tiers describe the NO_x limits to be achieved after 2000, 2011 and 2016. In addition to the International Air Pollution Prevention (IAPP) Certificate, the ship must comply with the NO_x Technical Code 2008, have an Engine International Air Pollution Prevention (EIAPP) Certificate and possesses NO_x Technical File and a record book of engine parameters.
- Regulation 14 – Sulphur oxides (SO_x): This regulation sets maximum sulphur contents for fuels used on ships (3.50% after January 2012) and the concept of SO_x emission control area (SECA) with the current designated SECAs as well as relevant sulphur limits.
- Regulation 15 – Volatile Organic Compounds (VOCs): The regulation emphasizes on the need to reduce VOC releases occur during loading in oil ports and terminals. All oil tankers visiting such regulated ports/terminals (ports/terminals that are designated as VOCs control ports/terminals based on this regulations) must be equipped with collection systems and after 2010 a VOC management plan must be implemented.
- Regulation 16 – Shipboard incineration: Incinerators have to be approved and meet the IMO standards. Various substances are prohibited to incinerate.
- Regulation 18 – Fuel oil availability and quality: The regulation covers the availability, the quality, the supervision of suppliers, the PSC aspects, fuel sampling and sample retentions, the bunker delivery note, etc.

The NO_x Technical Code and some other IMO Resolutions support the implementation of this part of MARPOL Annex VI.

MARPOL Annex VI Chapter 4 – Regulation on energy efficiency for ships: This chapter 4 was developed to regulate energy efficiency of ships. It came into force in January 2013. Under this chapter, the following regulations are specified:

- Regulations 19 – Application: This regulation specifies the application domain and scope of the Chapter 4 regulations.

- Regulations 20 – Attained Energy Efficiency Design Index (Attained EEDI): This regulation specifies the requirements on Attained EEDI including the calculation processes and survey and verification aspects.
- Regulations 21 – Required EEDI: This regulation deals with the Required EEDI, its calculation using reference lines and reduction factors and its calculation processes. Regulation 21.5 also makes provisions that the EEDI must not impair the safe manoeuvrability of the ships.
- Regulation 22 - Ship Energy Efficiency Management Plan (SEEMP): This regulation specifies the requirement for ships to have a SEEMP on board and how the SEEMP should be developed.
- Regulation 23 - Promotion of technical co-operation and transfer of technology relating to the improvement of energy efficiency of ships: This regulation emphasizes the importance to enhance technical cooperation and transfer of technology to support energy efficiency improvements on the world fleet, in particular for the benefit of developing countries. (MARPOL TRAINING 2020)

1.1.7 IMO Response to control of GHG emissions from international shipping

1.1.8 Shipping GHG emissions context and IMO role

While shipping, in comparison to other transport modes, is the most efficient mode of cargo transport and was considered environmentally-friendly, the significant growth of seaborne trade and its externalities and societal costs have modified this perception. The growth of transportation by ships increased the energy consumed by shipping and, in spite of the improvement in the energy efficiency of ship engines, the global shipping emissions amplified quantitatively. This number and volume growth not only have implications for oceans as sea routes but also affects air quality in port areas and coastal zones. Therefore protection of the marine environment not only has implications for each country but also significant global benefits. This is especially true for environmental issues (in particular the

GHG emissions) which is truly global in nature, and any benefits accrued at national level will fully contribute to the global benefits.

Responsibility under UN Framework Convention for Climate Change

Under UNFCCC and Kyoto Protocol, the responsibility for dealing with GHG emissions from international shipping and aviation are given to the IMO and the ICAO respectively based on Article 2 of Kyoto Protocol: *“The Parties included in Annex I shall pursue limitation or reduction of emissions of greenhouse gases not controlled by the Montreal Protocol from aviation and marine bunker fuels, working through the International Civil Aviation Organization and the International Maritime Organization, respectively”*. (Drost 2008, 280).

“After the adoption of Kyoto Protocol, shipping could not stay away from the international efforts on GHG reduction. Work by IMO started in 1997, lead to a number of regulations and work still continues on further regulatory measures. Before that, IMO relevant studies will be introduced first. During the period 1997 till now, IMO conducted three major studies on GHG emissions from international shipping as explained in the following sections” (IMO: Module 1. 2016, 40).

1.1.9 First IMO GHG study 2000

“As an outcome of the 1997 MARPOL Conference, the decision to study CO₂ emission from ship led to the launching of a complete study on the topic. Released in 2000, the first study constituted the initial step of deliberations about the development of new rules to address the GHG controls in shipping. This study, using data from 1996, estimated that ships emitted about 420 million tonnes of CO₂ per year and thereby contributed about 1.8% of the world's total anthropogenic CO₂ emissions that year.

The Study also stated that technical and operational measures have a limited potential for contributing to reduced emissions from ships if the increase in demand for shipping services and market requirement for increased speed and availability continued.

The main outputs of the study were:

- *Shipping is considered an efficient means of transportation compared to others.*
- *It is difficult to assess with accuracy the overall impact of shipping - because of discrepancy in data concerning bunker figures and the uncertainties in the fuel consumption models.*
- *The impact of air emission should include NOX, SOX and GHG emissions.*
- *Significant reduction of GHG emission can be achieved through operational and technical measures. However, the increase in demand for shipping services may impede operational and technical savings.*
- *Environmental indexing, market-based mechanisms and design standards may be appropriate measures to implement in the future.*

Despite its relevance, no immediate regulation followed after the presentation of this study. The lengthy discussion on the IMO involvement and approach to the climate change necessitated an updated study” (IMO: Module 1 2016, 41-43.)

1.1.10 Second IMO GHG study 2009

“The second IMO GHG study was commissioned in 2007 and delivered in 2009. This study updated the GHG emissions figures/inventory for shipping and estimated the potential for reduction of emission according to the implementation of different technologies and operational energy efficiency measures. In addition, cost effectiveness and policy evaluation options were considered. This second study initiated a proposed framework to support the regulatory decision-making process.

Presented during the Copenhagen UNFCCC’s COP discussions on climate change in December 2009, the Second IMO GHG Study 2009 forms the scientific background for the present IMO policy and regulatory frameworks that was developed soon thereafter. The intention of the document was to provide a solid research-based data and information to the

shipping community in order to help them for regulatory decision making. Mr. Mitropoulos, the then Secretary General of the IMO recalled in a foreword to the document its objectives:

“I trust that this Second IMO GHG Study will become the paramount reference for the Organization’s Marine Environment Protection Committee in making well-informed and balanced decisions towards the development and adoption of a robust regime to regulate shipping emissions at the global level.

This study is documented under nine chapters as follows:

- 1. Executive Summary*
- 2. Introduction to shipping and its legislative framework*
- 3. Emissions from shipping 1990–2007*
- 4. Reductions in emissions achieved by implementation of MARPOL Annex VI*
- 5. Technological and operational potential for reduction of emissions*
- 6. Policy options for reductions of GHG and other relevant substances*
- 7. Scenarios for future emissions from international shipping*
- 8. Climate impact*
- 9. Comparison of emissions of CO₂ from ships with emissions from other modes of transport*

A large number of Appendices are also included in the report. Below, some of the chapters more relevant to topic of this training course are further elaborated.” (IMO: Module 1. 2016, 41-43).

1.1.11 Third IMO GHG study 2014

“Before making the inventory of the GHG emission by shipping, the chapter begins with few introductory comments on the scope and uncertainties. Accordingly, the scope of the emission included in the inventory is taken the same as those in the UNFCCC guidance.

“In line with the above-mentioned guidelines for creating an inventory of emissions, the following pollutants were considered for exhausts: NO_x, SO₂, PM₁₀, CO, CO₂, N₂O, CH₄ and NMVOC.

The limitations on estimation of the emissions levels are then deliberated and the following considerations are made:

- Exhaust gases uncertainties are the same as those of the previous study and are estimated to be around +/- 20%.*
- Emission of ODS are detailed by sources: Refrigerants, reefer ships & reefer containers; calculation limits are presented.*
- Limits and uncertainties in estimating the release of Methane (CH₄) and Non-Methane Volatile Organic Compound (NMVOC) are presented.*
- Sulphur hexafluoride (SF₆) and Fluorocarbon (PFCs) on board ships are not emitted to any sufficient degree to be considered as significant issues.*

Despite all these limitations, the emissions levels from international shipping were established. As table below indicates, amongst various types of the GHG emissions, the GHG emissions from shipping are overwhelmingly dominated by CO₂. Thus, CO₂ is established as the main GHG concern for shipping that should be the subject of future regulations. All other GHG emissions by international shipping are considered as negligible.” (IMO 2016, 42.)

1.1.12 History of IMO GHG related activities

“With a view to addressing the issue of air emissions from international shipping, IMO in its 1997 MARPOL Conference adopted MARPOL Annex VI on prevention of air pollution from ships and also adopted Resolution 8 on ships CO2 emissions as a starting point inviting:

- the IMO Secretary-General to co-operate with the Executive Secretary of UNFCCC in the exchange of information on the issue of GHG emissions;
- IMO to undertake a study of GHG emissions from ships for the purpose of establishing the amount and relative percentage of GHG emissions from ships as part of the global inventory of GHG emissions; and
- The Marine Environment Protection Committee (MEPC) of IMO to consider feasible GHG emissions reduction strategies.

This was the starting point for IMO debates and decisions on GHG emissions from international shipping that still continues. Figure below provides the important chronological order of the IMO activities so far since 1997”. (IMO: Module 1. 2016, 52.)

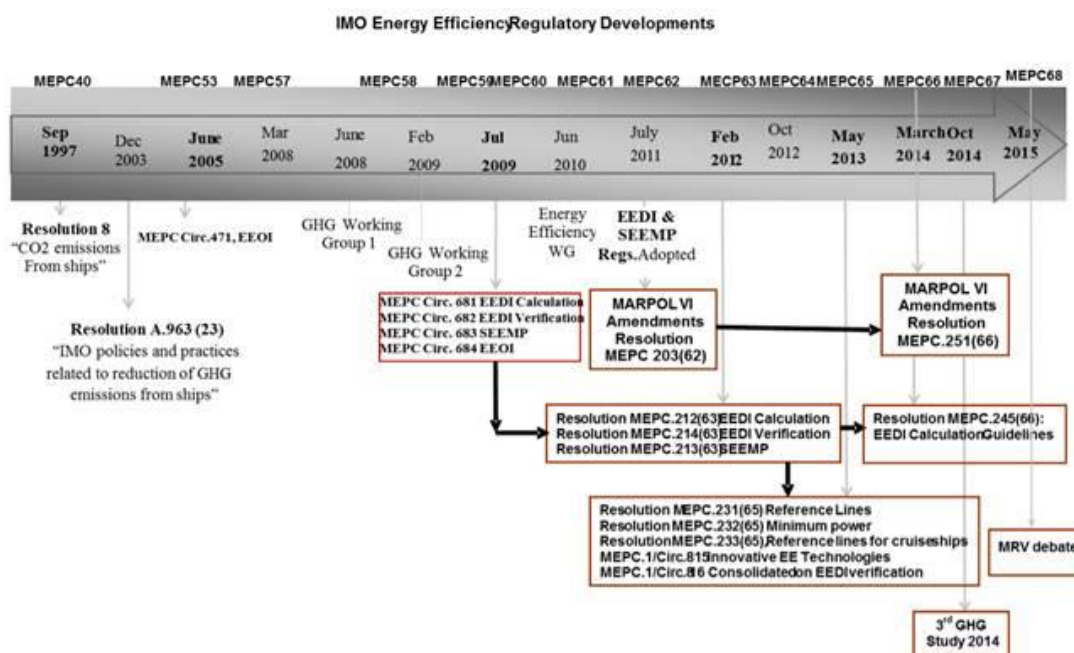


Figure 5: IMO GHG control related activities in chronological order (IMO Module 1 2016, 53).

“Further details of the IMO activities are given below in chronological order.

1997-2003

As a follow-up to Resolution 8, the First IMO GHG Study 2000 was completed and presented to the forty fifth session of the MEPC (MEPC 45) in June 2000.

2003-2008

In an effort to further address the issue of GHG emissions from ships, the IMO Assembly adopted, in December 2003, Resolution A.963 (23) on "IMO Policies and Practices related to the Reduction of Greenhouse Gas Emissions from Ships." As follow-up to this resolution, MEPC 55 (October 2006) approved the MEPC's "Work plan to identify and develop the mechanisms needed to achieve the limitation or reduction of CO2 emissions from international shipping," inviting Member Governments to participate actively in the work plan.

MEPC 55 also agreed to update the “First IMO GHG Study 2000” to provide a better foundation for future decisions and to assist in the follow-up to resolution A.963 (23). MEPC 56 (July 2007) adopted the terms of reference for the updating of the study. The report of this study prepared by a consortium and was submitted to MEPC in 2009 under the title Second IMO GHG Study 2009”. (IMO: Module 1. 2016, 53.)

MEPC 59 (July 2009)

“The MEPC work plan culminated at MEPC 59 with the MEPC agreeing to a package of technical and operational measures to reduce GHG emissions from international shipping and also agreed on a plan for further consideration and development of suitable and efficient Market Based Measures (MBMs) to complement the technical and operational reduction measures and to provide economic incentives for the shipping industry. The MEPC further agreed that any regulatory scheme to control GHG emissions from international shipping should be developed and enacted by IMO as the most competent international body

IMO's GHG / energy efficiency work plan at the time contained three distinct components:

- *The technical measures that will mainly be applied to new ships. This was reflected in the development of EEDI related regulations.*
- *The operational measures for all ships in operation (new and existing). This was reflected in the development of SEEMP and EEOI.*
- *The MBMs providing market / competition incentives to the shipping industry by setting a sort of cost item for CO2 emitters and incentives for those who reduce their CO2 emissions.*

Technical and operational measures:

MEPC 59 finalized a package of technical and operational measures in the form of Guidelines for EEDI, SEEMP and EEOI. Relevant Guidelines developed and approved (in the form of Circulars) for the then voluntary application.

Market Based Measures (MBMs):

The agreed package of the above technical and operational measures is a very important step in ensuring that the shipping industry has the necessary mechanisms to reduce its GHG emissions. However, the MEPC recognized that these measures would not be sufficient to satisfactorily reduce the amount of GHG emissions from international shipping in view of the growth projections of world trade. Therefore, MBMs was considered as a market-driven option by the MEPC in line with its GHG work plan. At the time, it was understood that a good MBM would serve two main purposes: (1) Offsetting in other sectors of growing ship emissions and (2) Providing a fiscal incentive for the maritime industry to invest in more fuel efficient ships and technologies and to operate ships in a more energy efficient manner.

MEPC 60 (2010)

The main work accomplished during this session was the preparation of the “draft regulatory text” on mandatory requirements for the EEDI for new vessels and on the SEEMP for all ships in operation. The MEPC realised that to finalise the regulatory text, it is required to decide on issues concerning ship size, ship types, target dates and reduction rate in relation

to the EEDI requirements. The MEPC agreed in principle on the basic concept that a vessel's Attained EEDI shall be equal or less than the Required EEDI, and that the Required EEDI shall be drawn up based on EEDI reference lines and reduction rates. This became the subject of additional work and use of concrete methods for calculating the EEDI reference line using data from existing ships in the IHS Fairplay database. With regard to MBM, the MEPC agreed to establish an Expert Group on the subject to undertake a feasibility study and impact assessment of the various proposals submitted for a MBM instrument for international maritime transport.

MEPC 61 (2010)

technical and operational measure:

Having considered means by which technical and operational measures could be introduced in MARPOL Annex VI, there was further debates and agreement on how these regulatory texts should be introduced. The debate concentrated for the IMO Secretary-General to circulate proposed amendments to MARPOL Annex VI for mandatory application of EEDI and SEEMP regulatory text and relevant Guidelines that have already been disseminated for voluntary use. The issue of circulation by the Secretary General was the subject of much debate as some States did not consider it appropriate". (IMO: Module 1. 2016, 53-54.)

Market-Based Measures

"The scope of the work of the Expert Group was to evaluate the various proposals on possible MBMs, with the aim of assessing the extent to which they could assist in reducing GHG emissions from international shipping, giving priority to the maritime sectors of developing countries, least developed countries (LDCs) and Small Island Developing States (SIDS). The MBM proposals under review ranged from a GHG Fund or levy on all CO₂ emissions from international shipping or only from those ships not meeting the EEDI requirement, via emission trading systems, to schemes based on a ship's actual efficiency, both by design (EEDI) and operation (SEEMP).

The MEPC agreed Terms of Reference for an intercessional meeting of the “Working Group on GHG Emissions from Ships” to deal with relevant schemes and submissions and report back to MEPC 62.

MEPC 62 (2011)

The final breakthrough came at MEPC 62. As a result of lengthy deliberations, the amendments to MARPOL Annex VI in the form of “energy efficiency regulations for ships” was added as a new Chapter 4 to MARPOL Annex VI as a result of which EEDI and SEEMP became mandatory for applicable ships. Other amendments to Annex VI included addition of new definitions and the requirements for survey and certification, including the format for the International Energy Efficiency Certificate.

MEPC 63 (2012)

An important series of guidelines to support the uniform implementation of mandatory measures for ship energy efficiency (EEDI and SEEMP) was adopted by the MEPC in this session. During this session, the MEPC also continued its intensive discussion on MBMs for application to international shipping.

MEPC 64 (2013)

The MEPC continued to refine relevant Guidelines on calculation and verification of EEDI. MEPC additionally approved the following:

- *A number of UIs (Unified Interpretations) on definition of "new ships" for various EEDI phases, on timing of ships to have a SEEMP on-board and also on "major conversion" for energy efficiency purposes.*
- *Decided on development of interim guidelines for determining minimum propulsion power to maintain the manoeuvrability of ships in adverse conditions and draft Guidelines on treatment of innovative energy-efficiency technologies.*

- *A debate on Regulation 23 of chapter 4 of MARPOL Annex VI on “promotion of technical cooperation and transfer of technology” that led to a text of a draft resolution³ on issues relating to technology transfer for the improvement of energy efficiency of ships.*
- *In principle endorsed and outline for an update of the previous GHG Studies including GHG inventory. Finally, it decided to defer debates on MBMs to MEPC 65”. (IMO: Module 1. 2016, 55.)*

MEPC 65 (2013)

“During this MEPC meeting, the following were accomplished:

- *Resolution on MEPC.229 (65) on Promotion of Technical Co-operation and Transfer of Technology Relating to the Improvement of Energy Efficiency of Ships was adopted.*
- *Study to update the previous GHG Study approved: The MEPC approved the terms of reference and agreed to initiate a study for an update of previous IMO GHG Studies.*
- *Development of energy-efficiency regulations continued: The MEPC continued its work on further developing the EEDI and SEEMP framework. This included approval of draft amendments to MARPOL Annex VI to extend the application of EEDI to ro-ro cargo ships (vehicle carrier), LNG carriers, cruise passenger ships having non-conventional propulsion, ro-ro cargo ships and ro-ro passenger ships; and to exempt ships not propelled by mechanical means, and platforms including FPSOs and FSUs and drilling rigs, regardless of their propulsion; as well as cargo ships having ice-breaking capability.*
- *Adopted amendments to update a number of Guidelines on EEDI. Adopted those Guidelines that were approved under MEPC 64.*

- *Further measures to improve the energy efficiency of ships: The MEPC considered the importance of enhancing the existing framework (EEDI and SEEMP) for further reduction of shipping GHG emissions. As such the MEPC agreed to establish a sub-agenda item for discussion of further technical and operational measures for enhancing energy efficiency for international shipping, and to establish a working group under this sub-agenda item at MEPC 66.*

MEPC 66 (April 2014)

The following aspects were discussed but no substantive decision made:

- *Energy-efficiency measures for ships considered: The MEPC continued its work on further developing guidelines to support the uniform implementation of the regulations on energy-efficiency for ships.*
- *Technical co-operation and technology transfer discussed: The MEPC discussed the implementation of resolution MEPC.229 (65) on Promotion of Technical Co-operation and Transfer of Technology Relating to the Improvement of Energy Efficiency of Ships. The Ad Hoc Expert Working Group on Facilitation of Transfer of Technology for Ships (AHEWG-TT), established in accordance with the resolution, met during the session and agreed a work plan with the following terms:*
- *Assessing the potential implications and impacts of the implementation of the energy efficiency regulations in chapter 4 of MARPOL Annex VI, in particular, on developing States, as a means to identify their technology transfer and financial needs;*
- *Identifying and creating an inventory of energy efficiency technologies for ships;*
- *Identifying barriers to transfer of technology, in particular to developing States, including associated costs, and possible sources of funding; and making recommendations, including the development of a model agreement enabling the*

transfer of financial and technological resources and capacity building between Parties, for the implementation of the energy efficiency regulations.

- *Further measures for improving energy efficiency of ship: The MEPC discussed various submissions relating to proposals to establish a framework for the collection and reporting of data on the fuel consumption of ships.*

MEPC 67 (October 2014)

The following activities were carried out:

- *Energy-efficiency measures for ships considered: During the session, the MEPC adopted a number of changes to various Guidelines including:*
- *The 2014 Guidelines on survey and certification of the Energy Efficiency Design Index (EEDI), updating the previous version to include, for example, identification of the primary fuel for the calculation of the attained EEDI for ships fitted with dual-fuel engines using LNG and liquid fuel oil.*
- *The MEPC also adopted amendments to the 2013 Interim Guidelines for determining minimum propulsion power to maintain the manoeuvrability of ships in adverse conditions.*
- *A correspondence group was established to review the status of technological developments relevant to implementing phase 2 of the EEDI regulatory framework as foreseen under Regulation 21.6.*
- *Further measures - Data collection system for fuel consumption of ships: The MEPC agreed, in principle, to develop a data collection system for ships and, having agreed on the general description of the data collection system for fuel consumption of ships, agreed to the reestablishment of an intersessional correspondence group to develop full language regulatory text so that it can be readily used for voluntary or mandatory application of the system. The core elements of the data collection system included: (1) data collection by ships, (2) flag State functions in relation to data collection including verification and (3) establishment of a centralized database by the IMO.*

- *Third IMO GHG Study 2014 approved: The MEPC approved the Third IMO GHG Study 2014 providing updated estimates for GHG emissions from ships (see Section 6.3 for details of this study).*

MEPC 68 (2015)

In this session of the MEPC, the following were agreed:

- *Further development of energy-efficiency guidelines for ships: The MEPC continued its work on further develop and approved/adopted guidelines to assist in the implementation of the mandatory energy-efficiency regulations in particular the EEDI.*
- *EEDI review work to continue: The progress of the Correspondence Group established to review the status of technological developments relevant to implementing phase 2 of the EEDI regulations, as required under regulation 21.6 of MARPOL Annex VI, was received and MEPC decided to re-establish the Correspondence Group to further the work.*
- *Text agreed for further development of a data collection system: On “further measures”, the MEPC agreed that the full language text for the data collection regulations need to be enhanced. The proposed text was preliminary agreed and the Correspondence Group was re-convened to continue work on this text and report back to future MEPC meetings”. (IMO: Module 1. 2016, 55-57.)*

1.1.13 Current regulatory framework

“As discussed in previous section, through extensive discussions within the IMO, mandatory measures to reduce emissions of GHG from international shipping were adopted by Parties to MARPOL Annex VI at MEPC 62 in July 2011. This provided the first ever mandatory global GHG reduction regime for an international industry sector.

This amendments to MARPOL Annex VI Regulations for the prevention of air pollution from ships, added a new chapter 4 on Regulations on Energy Efficiency for Ships to make mandatory the Energy Efficiency Design Index (EEDI), for new ships, and the Ship Energy Efficiency Management Plan (SEEMP) for all ships. Other relevant amendments to Annex VI included new definitions and the requirements for survey and certification, including the format for the International Energy Efficiency Certificate. Additionally, voluntary Guidelines for calculation of Energy Efficiency Operational Indicator (EEOI), that was developed and agreed in 2009, can be used for operational monitoring of ships energy efficiency measures.

These technical and operational measures are collectively shown in figure below, which also indicates how EEDI, SEEMP and EEOI will work collectively to cover both ship design and operation”. (IMO: Module1. 2016, 58.)

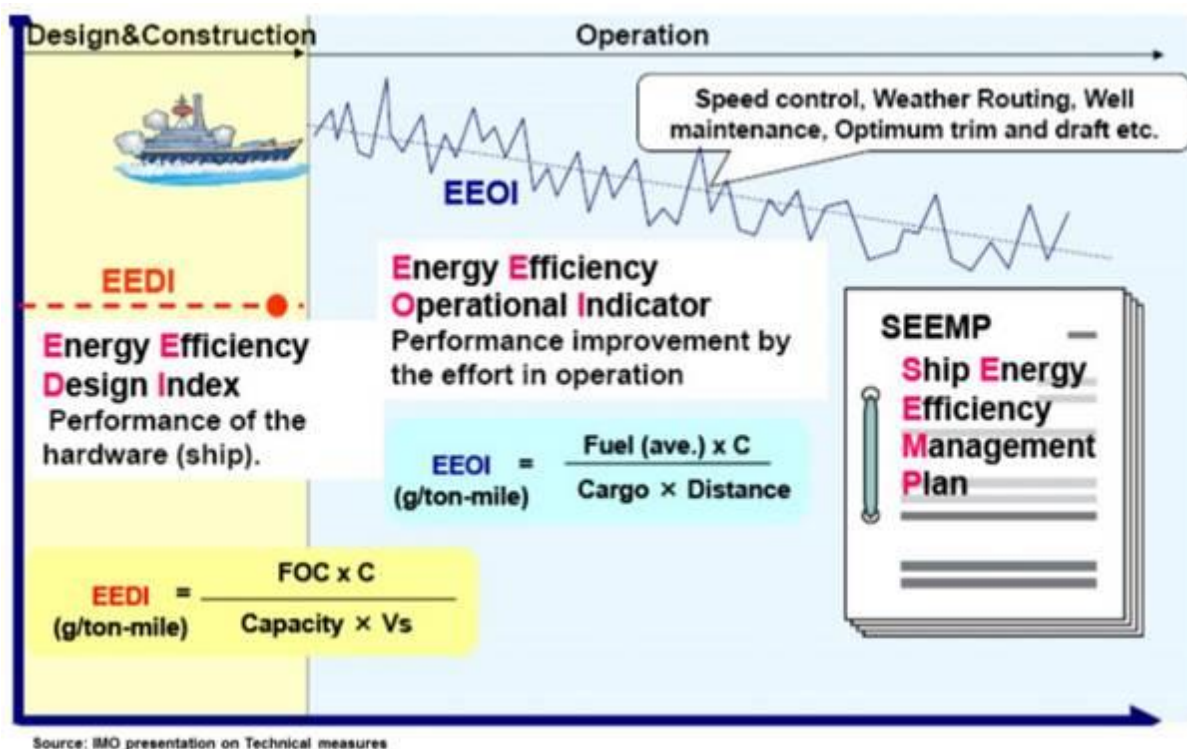


Figure 6: presentation on Technical measures (IMO Module 1. 2016, 58).

“An important series of guidelines to support the uniform implementation of the above mandatory measures are adopted, paving the way for the regulations to be smoothly and uniformly implemented by Administrations and industry. Some examples of these Guidelines include:

- *2012 Guidelines for the development of a Ship Energy Efficiency Management Plan (SEEMP);*
- *2013 Guidelines for calculation of reference lines for use with the Energy Efficiency Design Index (EEDI).*
- *2014 Guidelines on survey and certification of the Energy Efficiency Design Index (EEDI), as amended; and*
- *2014 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships, as amended". (IMO: Module 1. 2016, 58.)*

1.1.14 IMO further energy efficiency measures

"A number of studies including IMO MEPC 63/INF.2 by Bazari and Longva (2011) and the Third IMO GHG Study 2014 indicate that successful implementation of the shipping technical and operational energy efficiency regulations could reduce shipping GHG emissions significantly, but on their own they are not sufficient to prevent the rising trend in shipping GHG emissions under all existing growth scenarios. Consequently, the IMO began working on further technical and operational measures including the development of a global shipping data collection system for energy efficiency as a first step priority area. Since April 2014 as a result of MEPC 67 and 68 meetings, IMO reached preliminary conclusions on a general description of such a global data collection system. Based on results of the relevant MEPC working group deliberations, the data collection and reporting requirements would apply to ships involved in international shipping over a certain size threshold and regardless of their flag State". (IMO: Module 1. 2016, 58-59.)

"The draft developed data collection system identifies three core elements including: (1) data collection by ships, (2) flag State functions in relation to data collected including verification and (3) establishment of a centralized database by the IMO. As it stands now (2015), the following features are under considerations for the IMO data collection system:

- *Applicable to ships of gross tonnage more than 5000 GT*
- *Annual reporting*
- *IMO number for ship identification*
- *Confidentiality of some data such as transport work will be observed.*
- *Guidelines will be developed to deal with various details of data collection and verification activities.*
- *Registered owner will be responsible for submission of data to Administration*
- *Administration will be responsible for verification (can be delegated to Recognized Organizations).*
- *A Statement of Compliance (SoC) will be issued by the Administration to each ship annually.*
- *PSC (Port State Control) will examine SoC for enforcement*
- *In addition to ship's fuel consumption, other data may be collected such as transport work and distance sailed.*

Thus in summary, beginning at a specific date, ships should annually submit their data to a centralized database maintained and managed by the IMO. Flag States should put in place mechanism(s) to ensure compliance by the ships entitled to fly their flag with the annual data collection requirements; and that data included in annual reports is sent to the centralized database. The compliance system of the flag State should have provisions for the transfer of ownership and change of flag. The above is the current general agreement; however, this is a work-in-progress at the IMO that is planned to be finalised in the future (expected by MEPC 70 in late 2016). It is worth noting that EU has already legislated an MRV (Measurement,

Reporting and Verification) system for shipping that has similarities to IMO current work". (IMO: Module 1. 2016, 58-59.)

1.1.15 Implementation and enforcement support

IMO Technical Co-operation (TC) programme

"IMO through its Technical Cooperation Department and relevant budgets as well as through donor country funds organises a number of activities mainly in area of capacity building in the form of training workshops. In specific area of shipping GHG control, the following activities have been done so far:

- *National and regional workshops on MARPOL Annex VI and GHG emissions from international shipping with the main aim of raising awareness on the subject. A number of such workshops have already been conducted in a number of countries and regions.*
- *Under the IMO's Integrated Technical Co-operation Programme, a sum of \$400,000 was allocated for the 2012 to 2013 biennium for various national and regional capacity building activities. This sum financed regional training and seminars supporting capacity building and information exchange and sharing.*
- *A further \$400,000 has been allocated for the 2014 to 2015 biennium to sustain the level of technical cooperation interventions in various regions, for the effective implementation and enforcement of energy efficiency measures for ships.*
- *In addition, some IMO members made donations for capacity building activities/workshops to support the implementation of the existing international energy efficiency rules and assess the need for technology transfer". (IMO Module 1. 2016, 58.)*

IMO-UNDP-GEF Initiative

“1. Legal, Policy and Institutional Reforms (LPIR): This is the priority component within the project and aims to improve the host country legal, policy and institutional frameworks. This will be achieved via carrying out country status / baseline assessment, development of global guidance and model legislations, support for customisation and finally the implementation.

2. Capacity building and knowledge exchange: The core of this activity includes the long-term capacity-building for the accelerated implementation of IMO energy efficiency regulations. This will be achieved via extensive set of training activities, workshops, participation in international events as well as dissemination of information.

3. Public-private partnership for innovation and R&D: This activity primarily aims to catalyse maritime sector energy efficiency innovation and R&D. To achieve this, the project aims to promote partnerships such as (1) global forums to highlight best practices and R&D on maritime energy efficiency and (2) formation of a Global Industry Alliance for industry, academia and ship design and operation R&D community to promote debates and R&D”.
(IMO: Module 1. 2016, 58-59.)