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# REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL

## on implementation and compliance with the sulphur standards for marine fuels set out in Directive (EU) 2016/802 relating to a reduction in the sulphur content of certain liquid fuels

# 1. Reporting on compliance with the sulphur standards, evaluating the need for further strengtening of the Directive's provisions and considering the potential for further reducing air pollution

Council Directive 1999/32/EC relating to a reduction in the sulphur content of certain liquid fuels[1] has been substantially amended several times, lastly by Directive 2012/33/EU of 21 November 2012 as regards the sulphur content of marine fuels[2] which entered into force on 17 December 2012 and had to be transposed by 18 June 2014. To preserve clarity and rationality following the different substantial amendments of Council Directive 1999/32/EC, it was codified as Directive (EU) 2016/802 of 11 May 2016 relating to a reduction in the sulphur content of certain liquid fuels[3] (hereinafter "the Sulphur Directive").

The Sulphur Directive's principal aim is to reduce harmful health effects and environmental damage caused by sulphur dioxide ($SO_2$) emissions resulting from the combustion of certain types of liquid fuels. Irrespective of Articles 3 and 4 which regulate the sulphur content of heavy fuel oil (HFO) and gas oils used in certain combustion plants on land, the Directive now mostly regulates the sulphur content of liquid fuels used by ships ('marine fuels').

Article 14(1) of Directive (EU) 2016/802 requires Member States to submit each year by 30 June a report to the Commission outlining compliance with the sulphur standards of the liquid fuels falling within the scope of the Directive on the basis of checks carried out in the preceding year. On the basis of these national reports and on the notifications regarding the non-availability of marine fuels, the Commission shall each year report on the implementation of the Directive. Article 14(1) furthermore requires the Commission to evaluate the need for further strengthening of the relevant provisions of the Directive and to make any legislative proposals to that effect.

The transposition deadline of Directive 2012/33/EU was 18 June 2014. Notwithstanding, the main change brought by Directive 2012/33/EU, namely the mandatory use of low sulphur marine fuels in the Baltic Sea and North Sea designated as Sulphur Oxides Emissions Control Areas ('European $SO_x$-ECAs'), took effect only on 1 January 2015. Consequently, the Commission received Member States' first reporting on compliance with the new sulphur requirements in the European $SO_x$-ECAs not earlier than 30 June 2016. However, considering that for their 2016 reporting not all Member States made use yet of the new reporting tools and template, the EU-wide picture of the level of enforcement and compliance with the new sulphur standards was still somewhat convoluted in 2016. Thus, to present the European Parliament and Council a more stable and aggregated overview of the level of enforcement and compliance with the stricter sulphur standards for marine fuels since the entry-into-force of the low sulphur requirements in the European $SO_x$-ECAs on 1 January 2015, the Commission decided to cover the years 2015 to 2017 jointly in this single report.

[1] OJ L 121 of 11.5.1999, p. 13
[2] OJ L 327 of 27.11.2012, p. 1
[3] OJ L132 of 21.5.2016, p. 58

This report also provides an overview of the relevant EU support mechanisms put in place to support Member States and the European shipping industry with implementing, enforcing and complying with the amendments brought by Directive 2012/33/EU. It finally addresses technical assistance provided to neighbouring countries, international cooperation, and puts forward some suggestions for further strengthening some of the Directive's provisions.

In accordance with Article 14(2) of Directive (EU) 2016/802, the Commission already addressed the costs and benefits of potential additional Union action on reducing air emissions including from shipping in its 'Clean Air Policy Package'[4,5] of December 2013 which followed from an in-depth review of the EU's air quality policies. Following this review, the Commission decided to not put forward a specific legislative proposal addressing ship emissions as part of its Clean Air Policy Package. Nonetheless, in its proposal for a Directive on the reduction of national emissions of certain atmospheric pollutants[6] the Commission included a provision (Article 5(1)) that would allow Member States to 'offset' their total national emission reduction obligations by the reduction of $SO_2$, nitrogen oxides ($NO_x$) and fine particulate matter ($PM_{2,5}$) emissions achieved through additional measures regulating air pollution from ships. However, this proposed flexibility, or any other provision addressing a reduction of ship emissions, was not included in Directive (EU) 2016/2284 on the reduction of national emissions of certain atmospheric pollutants[7] (the 'new NEC Directive').

The Commission continues to assess progress in reducing emissions from ships, including emissions other than $SO_x$, and the potential for further reduce emissions from this sector. On-going initiatives in that regard are also briefly set out in this report.

## 2. Main changes and effects brought by Directive 2012/33/EU

In 2008, the International Maritime Organisation (IMO) adopted amendments to Annex VI to the International Convention for the Prevention of Pollution from Ships (the 'revised MARPOL Annex VI') containing regulations for the prevention of air pollution from ships. The revised MARPOL Annex VI entered into force on 1 July 2010 and Article 1(6)(b) of Directive 2012/33/EU introduced one of the main changes of the revision, namely the mandatory use of marine fuels with a maximum 0,10% sulphur content in $SO_x$-ECAs as of 1 January 2015, into Union law (Article 6(2) of Directive (EU) 2016/802).

Similarly to the revised MARPOL Annex VI, Article 1(6)(c) of Directive 2012/33/EU also established the use of fuels with a maximum sulphur content of 0,50% in all other waters falling under the jurisdiction of a Member State ('European waters') outside the $SO_x$-ECAs as from 1 January 2020 (Article 6(1) of Directive (EU) 2016/802). However, contrary to the revised MARPOL Annex VI, the coming into effect of this requirement in the EU in 2020

[4] See: VITO, March 2013, 'Specific evaluation of emissions from shipping including assessment for the establishment of possible new emission control areas in European Seas'
[5] See: http://ec.europa.eu/environment/air/clean_air/index.htm
[6] COM(2013)920 final
[7] OJ L 344 of 17.12.2016, p. 1

was not subject to a later review of availability of compliant fuels, thus ensuring legal certainty from the outset and leaving the industry sufficient time to prepare.

So far the mandatory use of marine fuels with a sulphur content of 0,10% in the European $SO_x$-ECAs as from January 2015 has proven to effectively contribute to achieving the Directive's purpose of reducing harmful effects of sulphur dioxide emissions from ships on humans and the environment. Over 93% of the inspected ships in the $SO_x$-ECAs respected the stricter sulphur concentrations which lead to a significant reduction of sulphur dioxides concentrations in ambient air in regions bordering the $SO_x$-ECAs (e.g. up to 60% in Denmark[8], to 50% reduction at the German North Sea island 'Neuwerk'[9] and the Swedish islands of Öland (Ottenby) and Gotland (Hoburgen)[10], and over 20% reduction in the Rotterdam-Rijnmond region[11]).

A reduction of $SO_2$ concentrations in ambient air is also expected for all other coastal regions in the EU once the 0,50% maximum sulphur content requirement will take effect in 2020. However, it will still have to be determined whether the 0,50% sulphur limit will bring the same benefits as the 0,10% sulphur limit in the European SOx-ECAs allowing all EU citizens to benefit from an equal protection from air pollution from ships.

## 3. Union support to Member States and industry to facilitate enforcement and compliance of the stricter sulphur standards

In the run-up to 1 January 2015, the price of marine fuels with a maximum of 0,10% sulphur ('marine gas oil' or 'MGO') was projected to be up to 65-80% higher than the price of the HFO used in the $SO_x$-ECAs until then.[12] Many ship owners and operators expected the coming into effect of the 0,10% sulphur content requirement to lead to considerable economic impacts resulting from a significant increase in operating costs, especially for ship owners with large parts of their activities in the European $SO_x$-ECAs. The Commission put forward a number of accompanying measures and support mechanisms (further elaborated below) to support enforcement and compliance with the stricter sulphur standards and to minimise unwanted collateral effects.

Several subsequent studies[13,14,15] concluded, however, that the introduction of the low sulphur requirements in the European SOx-ECAs did not result in any loss of traffic or significant

[8] Danish Ministry of Environment and Food, November 2016, 'Sulphur content in the air halved since 2014', see: http://en.mfvm.dk/news/news/nyhed/sulphur-content-in-the-air-halved-since-2014/

[9] Kattner et al., 2015, 'Monitoring compliance with sulfur content regulations of shipping by in-situ measurements of ship emissions', and Seyler et al., 2017, 'Monitoring shipping emission in the German Bight using MAX-DOAS measurements'

[10] IVL - Swedish Environmental Research Institute, November 2015, 'Reduced sulphur content in air after tightening of ship fuel regulations', see: http://www.ivl.se/

[11] Rotterdam Rijnmond Environmental Protection Agency (DCMR), July 2015, 'Cleaner air from cleaner shipping', see: http://www.dcmr.nl/nieuws/nieuwsberichten/2015/07/schonere-scheepvaart.html

[12] See: European Maritime Safety Agency, December 2010, 'The 0,1% sulphur in fuel requirement as from 1 January 2015 in SECAs – An assessment of available impact studies and alternative means of compliance'

[13] CE Delft, April 2016, 'SECA Assessment: Impacts of 2015 SECA marine fuel sulphur limits - First drawings from European experiences'

shifts towards road transport. No company or maritime service shutdowns, nor any decrease in cargo turnover in Northern European ports that can be directly linked to the SOx-ECA requirements were found, and no severe cases of unavailability of compliant fuels were reported. Whereas the drop of oil prices is considered as the main reason as to why no negative effects were observed from the low sulphur requirements in the SOx-ECAs, the EU's support for Member States and maritime stakeholders also contributed to keeping the impact of the low sulphur requirements on the sector's competitiveness and modal shares minimal.

### 3.1 The European Sustainable Shipping Forum

In follow-up to the 'Sustainable Waterborne Transport Toolbox' of September 2011[16], the Commission set up in 2013 the ESSF[17] as a special forum facilitating a structured dialogue and cooperation among different Commission services, Member States and maritime stakeholders to better address environmental sustainability challenges confronting the EU maritime transport sector. Besides technical matters related to the various low sulphur compliance options, the ESSF also addresses the competitiveness of the EU's shipping sector and new ways of financing sustainable maritime transport.

The ESSF consists of a plenary and technical expert groups (the 'sub-groups') and is chaired by the Commission while the European Maritime Safety Agency (EMSA) acts as technical secretariat. The ESSF currently comprises four specialized sub-groups[18], each consisting of Member State experts and stakeholders, and are co-chaired by the Commission, Member State and/or stakeholders representatives. The sub-group on the 'Implementation of the Sulphur Directive', later replaced by the sub-group on 'Air Emissions from Ships', had a central role in supporting preparations for the taking effect of the 0,10% sulphur requirement in the European $SO_x$-ECAs, and is currently supporting the preparations for the implementation of the 0,50% sulphur content requirement[19]. The scope of the ESSF is not limited to the implementation of the Sulphur Directive, and the Forum has also addressed greenhouse gas emissions from ships and ship-generated waste[20].

The ESSF provides concrete and tailor-made support to Member States and industry in the respective areas of the sub-groups. Its work facilitated the drawing-up of Commission and EMSA guidance documents, Commission implementing and delegated acts, (EU) submissions to the IMO and the review of Union legislative acts[21]. The ESSF reflects the productive cooperation between Commission services, national experts and stakeholders

[14] European Community Shipowners' Associations (ECSA) survey conducted in the context of the ESSF sub-group on Competitiveness (presented to the ESSF Plenary on 26.01.2016)
[15] Technical University of Denmark, 'Mitigating and reversing the side-effects of environmental legislation on Ro-Ro shipping in Northern EuropeRoRo SECA', implemented from 15/06/2015 to 14/06/2017
[16] COM(2013)475 final
[17] Commission Decision of 24 September 2013 on setting-up the group of experts on maritime transport sustainability - The European Sustainable Shipping Forum (ESSF), C(2013)5984 final
[18] Air Emissions from Ships; Marine Liquefied Natural Gas; Exhaust Gas Cleaning Systems; Competitiveness
[19] See the Commission's Register of Commission Expert Groups, nr. E02869, http://ec.europa.eu/transparency/regexpert/index.cfm
[20] The following sub-groups completed their mandate and were subsequently closed: Financing; Research and Development; Port Reception Facilities; Monitoring, Reporting and Verification of $CO_2$ emissions from shipping
[21] See for a list of deliverables on: http://emsa.europa.eu/main/sustainable-toolbox/relevant-eu-projects.html

aimed at reinforcing a sustainable and competitive EU shipping sector. In view of its success, the ESSF's mandate was extended until 30 June 2018[22] and the last ESSF Plenary meeting of 16 October 2017 recommended a further extension.

### 3.2 EU financial support for the uptake of clean ship technologies

The Commission actively supports increasing the sustainability of maritime transport in the EU through a wide-range of financial instruments aimed at research, development and deployment projects of innovative technologies or clean fuels.

The 'Horizon 2020' programme[23] co-finances Research and Innovation (R&I) projects that aim at technology improvements in support of sustainable shipping (e.g. exhaust treatment systems, clean and efficient engines, new technologies such as fuel cells, electrification and renewable propulsion power (e.g. wind), improved hydrodynamics) and preparing the EU's shipping industry to meet Union and international environmental obligations and objectives.

The Connecting Europe Facility (CEF) supports the promotion of green shipping through funding of 'green' infrastructure and on-board equipment. For the years 2014 and 2015 alone, the CEF (including the 'Motorways of the Seas' programme[24]) allocated over €185M to studies, pilot actions and infrastructure projects.[25]

To address the European shipping sector's challenge to access financial support from commercial banks for financing green ship technology, the Commission, following preparatory work by the ESSF and in close cooperation with the European Investment Bank developed the Green Shipping Guarantee (GSG) programme. The GSG programme is financed through the CEF and the European Fund for Strategic Investments (EFSI) and its total financial envelope amounts to €750M. The programme is expected to generate €3 billion of investments in the European shipping sector. In December 2017, the first transaction within the GSG programme was signed to finance the construction of a LNG fueled ferry[26].

### 3.3 Technical support to Member States by the European Maritime Safety Agency

The Commission tasked EMSA[27] with additional activities facilitating the implementation and enforcement of the low sulphur requirements. In this context EMSA provides dedicated technical assistance to Member States' administrations by means of workshops, training seminars[28], exchange-of-best-practices and other technical guidance and tools.

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[22] Commission Decision of 7.1.2016 - C(2015)9741

[23] The EU Framework Programme for Research and Innovation (2014 – 2020), see also: https://ec.europa.eu/programmes/horizon2020/en/area/transport

[24] See also: https://ec.europa.eu/inea/en/connecting-europe-facility/cef-transport/cef-transport-motorways-sea

[25] See also Commission SWD(2016)326 final, of 30 September 2016 on the implementation of the EU Maritime Transport Strategy 2009-2018, paragraph 52

[26] See: https://ec.europa.eu/commission/news/juncker-plan-france-signature-first-green-financing-maritime-sector-2017-dec-12_en

[27] On the basis of 'cooperation agreements' between DG Environment and EMSA, see: http://www.emsa.europa.eu/partnerships/operational-agreements.html

[28] See EMSA's full training plan on Union legislation for Member States: http://emsa.europa.eu/implementation-tasks/training-a-cooperation/trainings-for-member-states.html

The Commission also mandated EMSA to carry out a 'cycle of visits' to Member States to monitor the effective implementation of the Directive and relevant implementing legislation[29]. The visits by EMSA typically take several days during which the national legislation and procedures are discussed in detail with the different competent authorities (e.g. Ministries, Coast Guard, as well as local authorities such as port authorities). The cycle of visits started at the end of 2016 and is expected to be completed in 2021. By the end of 2017 seven Member States had been visited by EMSA. Initial reactions from the Member States underline the thoroughness of the visits and confirm how EMSA's findings increase mutual understanding and serve as catalyst for national dialogue and for follow-up actions to ensure the effectiveness of national implementation measures. EMSA foresees to organise a mid-term workshop in 2019 to discuss interim results. Once all Member States have been visited, EMSA will provide the Commission with a horizontal report containing general findings and conclusions on the implementation of the Directive.

### 3.4 Member State Committee for the Implementation of the Sulphur Directive

In accordance with Article 17 of Directive (EU) 2016/802, the Commission established the Committee on the Implementation of the Sulphur Directive to support its coherent and effective implementation (hereafter, "the Committee")[30]. It met for the first time in October 2014, and five times so far. The Committee assists the Commission with exercising its implementing powers, with drafting submissions to the IMO, and reviewing outputs of the ESSF Sub-groups on 'Implementation' and on 'Air Emissions from Ships'. Through the active engagement of Member State, the Committee has a key role in ensuring a consistent and cost-effective implementation and enforcement of the Directive across the EU, and is instrumental in preparing for the entry-into-force of the 0,50% sulphur requirement in 2020.

## 4. Support to compliance checking of the sulphur limits for marine fuels

Prior to 2012, in the absence of precise clauses in the Directive on the yearly number of ship inspections and fuel samples to be carried out by Member States, their overall number was relatively low and largely differed between Member States. To alter this, Directive 2012/33/EU empowered the Commission to adopt implementing acts on 'sampling methods' for marine fuels, the definition of a 'sample representative' and on the 'frequency of sampling' of marine fuels (Article 13(4) of Directive 2016/802/EU).

The Commission adopted on 16 February 2015 the Implementing Decision (EU) 2015/253[31] (hereinafter "the Implementing Act") laying down rules concerning the on-board sampling procedure, control of bunker suppliers as well as a binding number of ship inspections and

[29] Article 3 of Regulation 1406/2002/EC foresees that EMSA carries out visits to Member States to assist the Commission in monitoring and verifying the proper implementation and application of Union law. See: http://www.emsa.europa.eu/visits-to-member-states/reduction-sulphur-content-of-certain-liquid-fuels.html

[30] Consult the Commission Comitology Register for the 'Committee for the implementation of the Directive on Sulphur content in Marine Fuels', http://ec.europa.eu/transparency/regcomitology/index.cfm

[31] Commission Implementing Decision (EU) 2015/253 of 16 February 2015 laying down the rules concerning the sampling and reporting under Council Directive 1999/32/EC as regards the sulphur content of marine fuels, OJ L 41 of 17.2.2015, p. 55

fuel samples each Member State has to carry out annually to verify the sulphur content of marine fuels being used by ships operating in the waters falling under their competence.

After discussions with Member States and the ESSF, EMSA published in July 2015 its 'Sulphur Inspection Guidance'[32] which complements the Implementing Act in facilitating a harmonised approach to the verification of sulphur standards. The Guidance elaborates for instance on how to effectively use the available ship documentation (e.g. bunker delivery notes, the ship's log books including the Oil Record Books and Engine logbooks, tank soundings and fuel oil change-over records, tank plans or piping diagrams) for the purpose of compliance checking. EMSA also developed a model training course on enforcement of the Directive which has been delivered to over 200 Member States inspectors since 2015.

### 4.1 Sampling of marine fuels used on-board ships

Physical sampling of marine fuels being used by ships for the purpose of verifying their sulphur content should be carried out either by analysing the sealed 'bunker sample' or the 'representative sample' accompanying the bunker delivery note and available on-board, or by obtaining and analysing a 'fuel spot sample' drawn from the ship's fuel service system.

Whereas an IMO procedure for analysing the bunker samples in accordance with Regulation 18(8.1) and (8.2) of MARPOL Annex VI was already in place, the Implementing Act defined a procedure for drawing an on-board fuel spot sample from the ship's fuel service system. Prior to the Implementing Act, inspectors across the EU used different locations in the ship's piping system for taking samples which could affect the observed sulphur content of the samples. To encourage the development of an internationally harmonised procedure, the Union procedure for drawing spot samples was submitted to the IMO which resulted in the 'Guidelines for on-board sampling and verification of the sulphur content of fuel used on-board ships'[33], largely taking over the procedure defined in the Implementing Act.

### 4.2 Other compliance checking technologies

An increasing number of Member States uses compliance checking technology other than documentation checks and physical fuel sampling to obtain a quick indication of whether a ship appears compliant with the sulphur standards or whether there is a reasonable doubt that triggers targeting the ship for a formal inspection to check sulphur content of the used fuel.

Different 'alternative compliance checking technologies', such as portable sampling devices (which can give an almost immediate indication of the sulphur content of the fuels found on-board), remote sensing technology, and 'sniffers' (exhaust gas analysers) that can define the sulphur content from measuring the ship's exhaust gases while they are operating, have been installed onto bridges, port entry points, patrol vessels and on small planes and are being used or tested by different Member States. The EU also allocated funds to support the development and use of these technologies[34]. In addition, EMSA has recently contracted drones/'Remotely

[32] 'EMSA Sulphur Inspection Guidance under Council Directive 1999/32/EC' of July 2015
[33] MEPC.1/Circ.864 of 9 December 2016
[34] See for instance the COMPMON project: https://compmon.eu/

Piloted Aircraft Systems' (RPAS)[35] that can assist Member State authorities in detecting marine pollution (e.g. oil spills) or monitoring air emissions.

The use of these alternative technologies can reduce the overall cost and time associated with compliance checking of the sulphur standards for Member States. The Committee has exchanged experiences with using these compliance checking technologies, and their findings were shared with the IMO[36]. The Implementing Act specifically recognises the potential of innovative compliance verification technologies and encourages Member States to use those.

### 4.3 Mandatory frequency of inspections and fuel sampling

To ensure an equal enforcement burden among Member States and a level-playing-field for EU ports and operators, Directive 2012/33/EU empowered the Commission to define a binding frequency of inspections and sampling of marine fuels (Article 13(4) of Directive (EU) 2016/802) which was laid down in the Implementing Act.

This frequency is primarily determined by the annual number of individual ships calling in a Member State. Pursuant to Article 3(1) of Implementing Decision (EU) 2015/253, all Member States shall carry out inspections of the ship's documentation on at least 10% of the individual ships calling in their ports. Member States have to complement the documentation check by sampling and analysing the sulphur content of the fuels of 20 to 40% of the inspected ships depending on whether the Member State is (partly) bordering a $SO_x$-ECA or not. The frequency of sampling in the SOx-ECA areas is higher than that in other European waters given that the price premium for low sulphur marine fuels could incentivise operators to risk a potential penalty for not using compliant fuel. It remains the prerogative of national inspectors to select the ships that will be subject to an inspection and/or fuel sampling. In accordance with the Implementing Act the total number of yearly fuel samples for a Member State can be adjusted in case it makes use of alternative compliance checking technology.

The Commission may consider revising the inspection and sampling frequency in the future in view of the coming into force of the 0,50% sulphur requirement in 2020, but also to introduce a risk-based Union inspection approach to target enforcement efforts to the most likely offenders. The development of a such a mechanism requires substantial information on compliance patterns of ship-types, operators, routes and fuel suppliers to be available.

### 4.4 Sampling of marine fuels while being delivered to the ship

Whereas compliance checking of the sulphur content of marine fuels is mainly focused on the 'ship-side', Directive 2012/33/EU also introduced provisions to strengthen controls of fuel suppliers, i.e. the 'land-side' (Article 6(9) of Directive (EU) 2016/802). Member States are now obliged to take action against fuel suppliers that have been found to deliver marine fuel that does not comply with the specification on the bunker delivery note and to maintain a publicly available register of suppliers of marine fuels to increase transparency. Member States are also required to control marine fuel suppliers by taking samples of their products

[35] See: http://www.emsa.europa.eu/operational-scenarios.html
[36] IMO PPR 5/13/5 on a proposal for the consistent implementation of regulation 14.3.1 of MARPOL Annex VI

upon delivery to a ship in case of recurrent reports of alleged quality issues ('letters of protest') (Article 4 of Implementing Decision (EU) 2015/253).

In 2016 the Commission launched a study[37] to further assess the oversight and licensing procedures of bunker suppliers in the Member States. The study will also provide indications of where controls of marine fuel suppliers may have to be reinforced to ensure the delivery of high quality, compliant fuels to ships visiting EU ports[38].

## 5. Reporting by Member States and THETIS-EU

Reporting by Member States in the past had proved to be insufficient to obtain an EU-wide overview of compliance with the sulphur standards due to a lack of harmonised provisions on the content and the format of the Member States' reports[39]. The 2012 revision of the Sulphur Directive therefore empowered the Commission to adopt more detailed provisions on the content and format of the annual reports of Member States.

To that purpose, Article 7 of the Implementing Decision (EU) 2015/253 defines all information concerning the enforcement of the sulphur standards in marine fuels to be included in the annual reports of Member States. Annual reporting by Member States on their actions to verify the sulphur content of fuels used in combustion plants on land is done in accordance with a template that was agreed for voluntary use in the Committee in 2016.

In view of the taking effect of the low sulphur requirements in the $SO_x$-ECAs on 1 January 2015, the Commission tasked EMSA to develop a 'Union information system' for recording and exchanging the details and findings of inspections on-board ships, including from fuel sampling and analysis. EMSA designed 'THETIS-EU' which became fully operational on 1 January 2015.

THETIS-EU contains all mandatory reporting fields laid down in Article 7 of Implementing Decision (EU) 2015/253 and allows for almost real-time monitoring of the compliance record of individual ships in all Member States. All Member States use THETIS-EU (on a voluntary basis) and EU neighbouring countries may also be granted access to the system in the near future. THETIS-EU has significantly contributed to improving the quality and consistency of reporting on ships' compliance with the sulphur standards across the EU. Discussions with Member States are on-going on how to further enhance usefulness and user-friendliness of THETIS-EU, and how to adapt the system to future enforcement needs under the Directive.

In accordance with Article 8 of the Implementing Decision (EU) 2015/253 and to reduce the administrative burden for Member States, THETIS-EU can provide Member States a summary of the data inserted throughout the preceding year which can be used to comply

[37] See contract notice 2016/S 130 – 232460 of 8.7.2016

[38] Marine fuels currently fall outside the scope of the Fuel Quality Directive (Directive 98/70/EC). However, in view of the 0.50% maximum sulphur content in 2020 new types of fuels (incl. blends of oil based products) are being developed, and it would be useful to better control also other fuel quality parameters besides sulphur content of those new fuels.

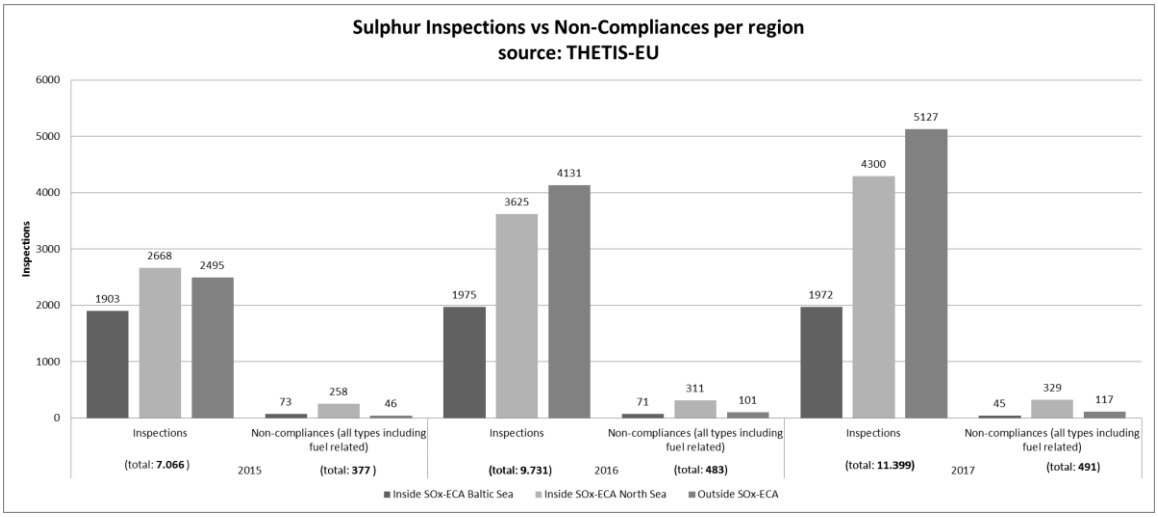
[39] See also Recital (18) of Directive 2012/33/EU

with their annual reporting obligation to the Commission. Following a decision of the Committee, an aggregated version of the sulphur inspection data contained in THETIS-EU is since June 2017 also publically available on EMSA's THETIS-EU portal[40].

## 6. Level of compliance with the sulphur standards for marine fuels

Between 1 January 2015 (when the system became operational) and 31 December 2017, over 28.000 specific inspections[41] (around 700 to 900 on average per month) have been recorded in THETIS-EU. Compared to the situation before the Implementing Act and THETIS-EU, the inspection volume increased from inspecting 1 in 1000 ships calling in EU ports to about 1 in 10 ships. Around 60% of those inspections (about 16.500) were carried out in the Baltic Sea and North Sea area, with the rest in other European sea areas. In the same period, around 1.350 non-compliances[42] have been recorded (around 5% of the total number of inspections). Over 80% of those cases were found in the SOx-ECAs and the remaining (mostly related to use of non-compliant fuels by ships at berth) in the other European sea areas.

As indicated in the graph below, the total number of reported annual inspections significantly increased from 2015 to 2017 while the annual number of reported non-compliances seemed to stabilize and proportionally decreased when compared to the increase of annual inspections.




The annual binding number of inspections and fuel samples in combination with the binding reporting format and the use of THETIS-EU has resulted in much more detailed and comprehensive reporting allowing for a better comparison of efforts between Member States. The good rate of compliance demonstrates the industry's efforts to contribute to reducing air pollution from maritime transport while the significant increase of monitoring and enforcing the sulphur standards by Member States also has had a significant deterrent effect.

[40] See: https://portal.emsa.europa.eu/web/thetis-eu/home
[41] Status on 30 December 2017
[42] Identified from documentation checks identifying incorrect/incomplete 'Ships Log Books', 'Fuel Change Over' procedures, Bunker Delivery Notes and records of the functioning of Emission Abatement Methods, or from analysis of fuel samples indicating an exceedance of the maximum allowed sulphur content.

Despite the generally reinforced enforcement effort, some Member States do not yet comply with their binding number of inspections and fuel sampling as laid down in the Implementing Act. The Commission is currently analysing Member States' efforts also knowing that some (local inspection) authorities experienced delays in recording the findings of their conducted sulphur inspections in THETIS-EU. The Commission will follow-up on Member States that are not compliant with the mandatory inspection and fuel sampling frequency as appropriate.

Reported data also show a need for additional enforcement action by Member States to check compliance with some other sulphur standards, notably the 1,50% maximum for fuels used by 'passenger ships on regular services' (Article 6(5) of Directive (EU) 2016/802), which in principle may also include cruise ships, outside the $SO_x$-ECAs like in the Mediterranean and insofar those vessels are considered to operate on a regular service[43], as well as the sulphur content and overall quality of marine fuels while being delivered to ships by fuel suppliers ('bunker suppliers') (Article 13(2)(b)(i) of Directive (EU) 2016/802).

# 7. Alternative compliance methods

Article 8 of Directive (EU) 2016/802 allows the use of 'emission abatement methods' such as alternative fuels, special equipment or installations on-board ships as alternatives to using low sulphur marine fuels provided that their use results in equivalent or even greater emission reductions and that all relevant conditions set in the Directive are fulfilled.

Regardless, as also referred to in recital (34) of Directive (EU) 2016/802, the use of alternative methods for complying with the sulphur content limits in Member States' waters should not lead to adverse impacts on other areas such as the aquatic environment resulting from polluting discharges to the seas or from solid waste streams or a significant increase of greenhouse gas emissions[44]. To the extent possible, the Commission assists Member States with ensuring compliance with seemingly overlapping obligations in Union legislation[45].

## 7.1 Exhaust Gas Cleaning Systems

Exhaust gas cleaning systems (EGCS), or 'scrubbers', cater for the continued use of HFO since they remove sulphur particles from the exhaust gas by leading it through a seawater or freshwater circuit. In terms of approval and use of exhaust gas cleaning systems, Article 9 and Annex II of the Directive (EU) 2016/802 refer to the relevant rules set by the IMO, while for ships flying the flag of an EU Member State, the EGCS shall be approved in accordance with

[43] In its judgement of 23 January 2014 following a request for a preliminary ruling from the Tribunale di Genova (Italy), the European Court of Justice in Case C-537/11 provided certain conditions to ascertain that a given cruise ship is to considered as a passenger ship operating on regular service**.**

[44] Allowing the use of alternative compliance methods to comply with the obligations set in the Directive does not relieve Member States of their obligations set out in other Union legislation such as the Water Framework Directive (Directive 2000/60/EC), the Marine Strategy Framework Directive (Directive 2008/56/EC), or the Directive on Port Reception Facilities (Directive 2000/59/EC.

[45] The acceptability of the discharge of wash water from exhaust gas cleaning systems is one of those issues. See: https://ec.europa.eu/transport/sites/transport/files/acceptability_of_discharges_of_scrubber_wash_water.pdf

Directive 2014/90/EU on Marine Equipment[46]. With the technical assistance of the ESSF, the EU contributes to steering discussions on the regulatory framework concerning the approval and use of exhaust gas cleaning systems in the IMO[47].

Effective controls of overboard discharges (e.g. wash water, bleed-off) from EGCS are needed to minimize potential negative effects on the marine environment caused by acidification (change in pH values) or releases of heavy metals impeding Member States to achieve the objectives laid down in Union surface water quality legislation[48]. To further reduce the negative impacts of EGCS on the marine environment and to ensure alignment with MARPOL Annex VI, the Commission recently proposed to include the residues and bleed-off water from EGCS as waste types in its proposal for a 'new' Directive on Port Reception Facilities for the delivery of waste from ships[49].

### 7.2 Liquefied Natural Gas (LNG)

The use of LNG as alternative fuel has the potential to not only reduce $SO_x$ emissions, but also to significantly reduce $NO_x$ emissions as well as particulate matter when compared to heavy fuel oil. Worldwide there are currently over 200 ships (already operating or on order) using LNG as alternative fuel, covering a wide range of ship sizes and types. Nevertheless, potential methane ($CH_4$) emissions resulting from the use of natural gas in ship engines need to be controlled to ensure the overall environmental benefits of using LNG as shipping fuel.

The ESSF sub-group on 'LNG as Marine Fuel' works on developing uniform rules that would ensure the safe and sustainable use of LNG in the EU, but also internationally[50]. In February 2018, EMSA published a Guidance document on safe bunkering of LNG[51] for port authorities and administrations which is largely based on the work, and experience of the experts in the ESSF. Directive 2014/94/EU on the deployment of alternative fuels infrastructure[52] (Annex II, point 3.1) foresees further standardisation of LNG refuelling points for sea-going ships and inland waterway vessels in European ports to facilitate their operation across the EU. Various Member States also announced further measures to promote alternative fuels for maritime transport in their 'National Policy Framework' adopted under Directive 2014/94/EU[53].

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[46] OJ L 257, 28.8.2014, p. 146–185

[47] The EU submitted various documents to the IMO concerning EGCS, such as IMO MEPC 71/9/1 on a revision of the IMO Guidelines for exhaust gas cleaning systems, IMO 5/11 on globally harmonised sampling procedure for discharge water, and IMO 5/11/1 on accidental breakdown, instrument malfunction and perceived temporary non-compliance and transient performance of vessels equipped with scrubbers

[48] E.g. Directive 2000/60/EC establishing a framework for Community action in the field of water policy ('Water Framework Directive') and Directive 2008/56/EC establishing a framework for community action in the field of marine environmental policy ('Marine Strategy Framework Directive'))

[49] COM(2018)33final

[50] See for instance the submissions to the IMO: MSC 94/11/1 on a standard LNG bunker delivery note and IMO MSC 94/11/2 on standard connectors

[51] See: http://www.emsa.europa.eu/news-a-press-centre/external-news/item/3207-guidance-on-lng-bunkering-to-port-authorities-and-administrations.html

[52] OJ L 307, 28.10.2014, p. 1–20

[53] See also the Commission's summary of the national plans for alternative fuel infrastructure: https://ec.europa.eu/transport/sites/transport/files/2017-11-08-mobility-package two/summary_of_national_policy_frameworks_on_alternative_fuels.pdf

### 7.3 Electrification

Due to their vicinity to urban areas, ships at berth can significantly contribute to air pollution in harbour cities and thus impede efforts to meet the Union air quality standards set in the Directive 2008/50/EC on Ambient Air Quality[54]. To further reduce harmful $SO_x$ emissions of ships at berth, the Directive encourages Member States to let ships use 'shore side electricity' or 'onshore power supply' ('OPS') while docked. Connecting ships to OPS would also contribute to reducing $NO_x$ and PM emissions, and could be promoted beyond the existing requirements in Article 4(5) of Directive 2014/94/EU to improve air quality in port cities.

In accordance with Article 19 of Directive 2003/96/EC on taxation of energy products and electricity[55], Member States can be authorised to apply a reduced rate of taxation on electricity provided to ships at berth which can encourage ship owners to invest in the necessary on-board equipment to use electricity from the land grid instead of from marine fuels. A number of Member States have already made use of this authorisation[56].

### 7.4 Approval and trials of new emission abatement methods

To promote the testing and development of new emission abatement technologies, the Directive allows Member States to approve, and to grant trial periods before approval, of new emission abatement methods on ships flying their flag. Article 10 of Directive (EU) 2016/802 requires Member States to notify to the Commission and any concerned port State their intention to grant such a trial period six months before its start and of its full results after it ended. Whereas since 18 June 2014 (transposition deadline of Directive 2012/33/EU) five Member States have notified their intention to grant trial permits to 26 ships in accordance with Article 10, it regrettably seems that not all Member States have notified their planned trials, and the results thereof, within the applicable timeframes set out in the Directive.

The Commission will follow-up as appropriate on Member States' compliance with the requirements concerning trials, including of non-EU flagged vessels operating in their waters, to ensure full transparency of the environmental benefits of new emission abatement methods and to avoid that certain ships would benefit of illegitimately long trial periods. THETIS-EU may also be adapted to cater for the notification of trial permits by Member States.

## 8. Additional support to reducing air pollution from ships

### 8.1 Preparing for the enforcement of the global 0,50% sulphur cap

In October 2016, taking into account the conclusions of a global availability assessment of compliant fuels, the IMO took the landmark decision to maintain 2020 as entry-into-force date of the global 0,50% sulphur cap[57]. The support of the EU and Member States was crucial

[54] OJ L 152 , 11.06.2008, p. 1 – 44
[55] OJ L 283, 31.10.2003, p. 51
[56] E.g. Germany, Sweden and Denmark (respective Council Implementing Decisions: 2014/722/EU of 14 October 2014, 2014/725/EU of 14 October 2014 and (EU) 2015/993 of 19 June 2015
[57] See: http://www.imo.org/en/mediacentre/pressbriefings/pages/mepc-70-2020sulphur.aspx

in achieving this decision which will contribute to reducing the adverse impacts of air pollution from ships for citizens all around the world.

Following from the different Union support mechanisms as described in this report, EU Member States are well prepared to effectively enforce the 0,50% maximum sulphur content as of 2020. However, at international level considerable work needs to be done to prepare for global compliance with and enforcement of the 0,50% sulphur cap laid down in MARPOL Annex VI. Effective preparation is essential to safeguard a global level-playing-field for operators and to reduce air pollution from ships across the world, notably in those coastal regions close to intensive international shipping routes.

The Commission and EU Member States, with the support of the ESSF sub-group on Air Emissions from Ships, actively contribute to the discussions on the preparation of the entry into force of the global sulphur cap in the IMO including by sharing their extensive experience of implementing the low sulphur requirements in the European SOx-ECAs from an Administration as well as from an operator perspective.[58]

## 8.2 External dimension of the Sulphur Directive

EMSA provides capacity building activities, like dedicated trainings on EU environmental legislation including on air emissions from ships to maritime administrations and inspectors of Candidate, potential Candidate countries and countries falling under the European Neighbourhood Instrument with the objective of enhancing enforcement of sulphur standards and approximating legislation to the Union acquis (in support of their on-going/planned accession process[59,60]). EMSA's support includes facilitating future access to THETIS-EU.

On 14 October 2016 the Ministerial Council of the Energy Community[61] decided to amend the Treaty by incorporating the Sulphur Directive and the Implementing Act[62]. This regulatory alignment will help further reducing $SO_X$ emissions in neighbouring regions.

As party to MARPOL Annex VI, the Convention on the Protection of the Marine Environment of the Baltic Sea Area (the 'Helsinki Convention'), and as a riparian state of the Baltic $SO_x$-ECA, the Russian Federation has an important role in checking compliance with the low sulphur requirements by ships visiting Russian ports in the Baltic Sea or flying the

[58] The EU and its Member States have sent specific submissions to the IMO (e.g. MEPC 70/INF.41 and PPR 5/13/5) and envisage submitting additional contributions.

[59] A dedicated air pollution training for candidate and potential candidate countries took place in May 2014. Another 2 day training is foreseen in the first quarter of 2018. See: http://www.emsa.europa.eu/implementation-tasks/training-a-cooperation/training-for-candidates-a-potential-candidates.html

[60] EMSA provides technical assistance under the 'TRACECA' project to beneficiary countries bordering the Black Sea and Caspian Sea, and to beneficiaries in the Southern Neighbourhood region under the 'SAFEMED IV' project. Both projects, 4M€ each, are funded by the European Neighbourhood Instrument (ENI).
See: http://emsa.europa.eu/implementation-tasks/training-a-cooperation.html

[61] The Energy Community is an international organisation consisting of the EU and Albania, Bosnia and Herzegovina, Georgia, the former Yugoslav Republic of Macedonia, Kosovo, Moldova, Montenegro, Serbia and Ukraine. It aims to extend the EU's internal energy market to south-eastern Europe and the Black Sea region.

[62] Ministerial Council Decision 2016/15/MC-EnC of 14 October 2016

Russian flag. Such efforts are crucial to ensure a level-playing-field, notably in the Baltic $SO_x$-ECA and access to THETIS-EU may support those enforcement efforts.

### 8.3 Nitrogen Oxides Emission Control Areas in the Baltic Sea and North Sea

Further to the Commission's 2013 Clean Air Policy Package, and in line with Article 14(2) of Directive (EU) 2016/802, the Commission continues to assess progress in reducing emissions from ships, including emissions other than SOx, and the potential for further reducing air pollution from the sector. In that context, it should be noted that nitrogen oxide (NOx) emissions from ships contribute to local air quality problems in the EU (caused by increased nitrogen dioxide (NO2) concentrations in ambient air) and to eutrophication of European seas.

In response to the joint request of the riparian states bordering the Baltic Sea and the North Sea, the IMO designated both seas as 'Nitrogen Oxides Emission Control Areas' (NOx-ECAs) in July 201763. This implies that an engine installed on a ship constructed after 1 January 2021 that operates in the Baltic Sea or the North Sea will have to comply with the 'Tier III' engine requirements laid down in MARPOL Annex VI. Without these control measures, NOx emissions from North Sea shipping would have contributed between 7% to 24% to the average annual ambient air concentrations of NO2 in the North Sea riparian states by 2030, while the application of 'Tier III' engine requirements can reduce eutrophication in several areas in the Baltic Sea by up to 20-30%64.

### 8.4 Further action on reducing air pollution from ships

Union air quality standards continue to be exceeded in many coastal cities and regions around the EU calling for action and measures that reduce emissions of atmospheric pollutants from all different contributing sources, including shipping. While as of 2020 all European citizens will benefit from a reduction of $SO_x$ emissions from shipping following the taking effect of the 0,50% sulphur standard, no immediate reduction of $NO_x$ emissions from shipping is foreseen outside the Baltic Sea and North Sea $NO_x$-ECAs even though exceedances of EU air quality standards for $NO_2$ frequently occur also in coastal regions in Southern Europe[65].

The Commission launched in 2017 a study to identify the health benefits and associated costs of designating additional Emission Control Areas (both for $SO_x$ and $NO_x$ emissions) in European seas other than the Baltic and North Seas. The study will also assess the benefits of lowering the sulphur content of marine fuels from 0,50% to 0,10% in European seas outside the $SO_x$-ECAs as of 2020. The Commission also tasked EMSA to develop inventories of total ship emissions ($SO_x$, $NO_x$ and PM) in all European waters based on ship activity data.

Work on both tasks should be finalized in 2018. It will allow the Commission and Member States to better assess the impact of ship emissions on air quality in coastal regions in support

[63] See: http://www.imo.org/en/MediaCentre/MeetingSummaries/MEPC/Pages/MEPC-70th-session.aspx
[64] See also the Commission proposal for a Council Decision of 22 September 2016 on the position to be adopted on behalf of the European Union at the IMO during the 70th and 71st session of the Marine Environment Protection Committee on the approval and adoption of amendments to MARPOL Annex VI concerning the designation and taking effect of the Baltic Sea and North Sea as NECA, COM(2016)617 final
[65] European Environment Agency (EEA), October 2017, 'Air quality in Europe - 2017 report'

of defining appropriate policies and measures that could further reduce the contribution from shipping to air pollution in the Union. It may also inform the discussions, under the 'Barcelona Convention' to which the Union is a contracting party, on the feasibility of a future designation of the Mediterranean Sea, or parts thereof, as a SOx-ECA.

## 9. Conclusions on implementation and compliance, and future actions

Following the thorough preparation and good collaboration with and among Member States and industry as described in this Report, steady progress has been made in implementing Directive 1999/32/EC since its latest revision in 2012 (today codified as Directive (EU) 2016/802). As a result of the good rate of compliance with and enhanced enforcement of sulphur standards, concentrations of $SO_2$ in coastal regions, notably in the $SO_x$-ECAs, have gone down significantly while the overall economic impacts on the sector remained minimal.

Industry's and Member States' experience with preparing for the change to the 0,10% sulphur content in marine fuels on 1 January 2015 in the European SOx-ECAs and compliance checking has provided valuable lessons which can be replicated in other European regions and internationally in view of the entry-into-force of the 0.50% global sulphur cap in 2020.

In accordance with Article 14(1) of Directive (EU) 2016/802, the Commission evaluated on the basis of the enforcement reports received for the years 2015 to 2017 and of other relevant developments as described in this Report the need to strengthen relevant provisions of the Directive or any appropriate legislative proposals to that effect. The Commission concluded that, to further ensure that the enforcement and compliance rates of the 0,50% limit laid down in Article 6(1) of Directive (EU) 2016/802 will be of a similar level as currently in the SOx-ECAs, it will assess the need of revising the inspection and sampling frequency, enhancing THETIS-EU to cater for the notification of trials and use of modern compliance checking technology (e.g. from sniffers and drones) and of increasing control of marine fuel suppliers which will facilitate a more advanced risk-based targeting of possible non-compliant vessels. To accommodate these possible changes, the Commission will consider, *inter alia*, amending the Commission Implementing Decision and making the use of THETIS-EU mandatory. The Commission will also look into the penalties Member States have imposed on non-compliant operators and assess whether those have a truly dissuasive effect. Furthermore, together with the Member States, and with the support of EMSA, the Commission will continue to actively support the EU's neighbouring countries with reducing $SO_x$ emissions from ships and the preparations by the IMO for the entry-into-effect of the global sulphur cap.

Further to Article 14(2) of Directive (EU) 2016/802, the Commission will also continue to consider the potential, including the costs and benefits, for reducing air pollution from ships also covering emissions other than $SO_x$.

These foreseen actions would enable all EU citizens to benefit from reduced air pollution caused by ships, further improve the cost-effectiveness of enforcing the sulphur standards contained in the Directive, facilitate international dialogue and ensure progress towards a sustainable and competitive EU shipping sector in close collaboration with Member States and maritime stakeholders.