
ECONOMIC IMPACTS OF SECA REGULATION ON MARITIME COMPANIES IN THE BALTIC SEA REGION – LITERATURE REVIEW AND LOW EMISSIONS RECOMMENDATIONS: PART 1

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Abstract: *The Intergovernmental Panel on Climate Change (IPCC) has stated that climate change is a major ongoing process requiring strict restrictive actions on a global level. This paper focuses on literature covering the impacts of the Sulphur Emission Control Area (SECA) based on academic papers published in 2017–2018. In numerous studies conducted before 2015, it was predicted that regulation would have serious impacts on maritime businesses. This is the first part of our research introducing the topic. The paper continues in Part 2.*

Keywords: *Literature, SECA, Impacts.*

1. INTRODUCTION

There are a large number of published high quality papers addressing a deep concern regarding climate change. The Intergovernmental Panel on Climate Change (IPCC) (2018) calls forth significant global actions. Similarly, the European Commission (EC) (2011; 2018) has stated that by 2050, greenhouse gases (GHG) should be reduced to a level that is 60% of the 1990 level. The International Maritime Organization (IMO) (2014) and the European Parliament (EP) (2005; 2012) have declared that sulphur emissions in the maritime sector should be lowered in Europe. This was not voluntary environmental action, but based on international agreements, because voluntary reductions are not widely adopted or working (Broadstock 2018). The Sulphur Emission Control Area (SECA) concerns all shipping companies operating in the Baltic Sea and in a part of the North Sea. The SECA regulation came into effect 1st January 2015. Vessels operating in the SECA region are not allowed to use fuel with a sulphur content exceeding 0.1%. The reasoning and philosophy behind this regulation is that (polluting) companies are not voluntarily limiting their emissions (Makkonen & Inkinen 2018). However, according to Linder (2018), external pressures such as community concerns regarding emissions and threats are also important in initiating voluntary restrictive actions and they may even be more important than the financial incentives. Global pollutant reductions in the maritime business sector also require compulsory environmental regulations based in

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international agreements. The challenge in achieving global agreements is that these regulations have significant impacts on current business environments and business models.

Traditionally, ships use fuel oil propulsion. Fuel oil can have a sulphur content of up to 3.5%. In comparison, the sulphur content of fuels used in trucks or passenger cars must not exceed 0.001%. Sulphur dioxide emissions from ships' combustion cause acid rain and generate fine dust. This can lead to respiratory and cardiovascular diseases and reduce life expectancy in the European Union (EU) by up to two years. The 2012 revision of the Sulphur Directive was designed to reduce the emissions of this air pollutant by setting maximum sulphur content levels for marine fuels. It also incorporated new standards set by the IMO into EU legislation – notably the 0.1% sulphur in fuel limit applicable in the SECAs. In 2016, the IMO made the landmark decision to maintain 2020 as an entry-into-force date of the global 0.5% sulphur cap, similar to Europe (i.e. in all sea waters outside SECAs, see EC 2018).

The aim of this study is to examine, based on research literature, how the economic impacts of SECA were studied from different industrial perspectives in research papers published in the Baltic Sea region. Before 2015, experts presented several anticipatory calculations which suggested that high prices of marine diesel oil would have serious impacts on maritime transport costs and the whole maritime industry (e.g. EMSA, 2010; Trafi 2013; Hämäläinen 2014). In Finland, maritime logistics costs in heavy industries often exceed 10% of turnover (Hämäläinen 2011). Therefore, all companies in the logistics chain are actively monitoring the way environmental regulations influence their economics.

Due to the SECA decision made by the EC, air polluting sulphur oxides (SO_x) have substantially decreased over the past years. This is the result of joint efforts by Member States and the maritime industry in implementing the new EU rules on cleaner shipping fuels. The lower sulphur emissions will improve the lives of citizens living in the SECA regions even in the short term. Gallo et al. (2016) argue that the voluntary environmental market has led to the slow spread of voluntary emission reduction projects developed by local authorities in the EU, despite their high potential. New and stricter environmental regulations are expected to obligate companies to improve their product development processes. This may lead to the utilization of ideas produced by innovative (or disruptive) actions, especially in those companies belonging to these specific industry clusters. Until polluting industries are regulated and transformed into cleaner actors, even down to the zero-level, various new ways of thinking are needed (Yigitcanlar & Inkinen 2019).

Psarafitis and Kontovas (2009) applied data from the IHS Fairplay database from 2007 (45.620 commercial ships accounted for) and stated in their study that container ships are the top CO₂-emitters in the world fleet, thus impacting the global atmosphere negatively. Unlike other studies, the work focused on cruise ships rather than on cargo ships, because a cruise ship's operation profile is more variable during the trip. In the global supply chain, marine transportation (per ton/km) has been considered the most environmentally friendly method of transporting heavy and bulk freight. According to Lindstad et al. (2011), emissions can be reduced by up to 30% with a negative CO₂ abatement cost per ton, if the existing fleet is replaced with larger vessels. Replacing old vessels may take as long as 25 years, so the reduction in emissions will be achieved gradually as the existing fleet is renewed. This assumption was based on the idea that

Heavy Fuel Oil (HFO) bunker fuels will be used in the future, but this may not happen, depending on the decisions made by the IMO (Marineinsight 2018).

These considerations motivate this study that assesses the academic literature focusing on emission control and businesses. This helps formulate the future models and their classifications used as measurement categories. The literature is classified and analysed in order to respond to the following main questions:

- How were the impacts defined and observed in the literature?
- How have business strategies adapted to SECA?
- Which low emission solutions is science proposing?

2. SELECTED STUDIES CONCERNING SECA BEFORE 2015: EXPECTED IMPACTS AND CONSEQUENCES

In his case study, Hämäläinen (2015) argued that the sulphur directive has direct impacts on the economy of the Nordic bulk industry. Additionally, Hämäläinen predicted that the impacts of the sulphur directive will vary heavily from market to market. In 2010–2014, the marine cluster community in the Baltic Sea Region (BSR) was concerned about the impacts of the SECA-regulation on their core businesses (such as freight transportation). However, due to falling oil prices since the beginning of 2015, these (feared) impacts were not realized. Still, the future impacts are a significant challenge in this oil dependent sector. New extra costs are difficult to cover without increasing customer prices. Due to the expected rising fuel costs, large shipping companies decided to order larger vessels in order to decrease the impact of bunker costs. Maersk ordered the new 18.000 TEU 'triple E' box ships, which would operate with less than 50% fuel consumption by using slower steaming in comparison to the average industry level. The slower speed, when combined with accurate weather data, enables voyage routings that produce significant cost and emission reductions (Lindstad et al., 2013). This may be expected, given the relatively high speeds of these vessels (20–26 knots) as opposed to those carrying bulk cargoes (13–15 knots), indicating a nonlinear relationship between the ship's speed, fuel consumption and emissions: when the ship's speed is reduced, fuel consumption and emissions are also reduced drastically. Lower speed can have important side benefits: cost reduction is one and the other is supporting a depressed market, in which shipping overcapacity is the norm these days. Slow steaming ships are sailing stocks. According to Yao et al. (2012), the fuel purchase location is an important variable in minimizing total bunker costs. Similarly, Psaraftis (2012) states that bunker price and market freight rate may influence route planning.

Several industries were concerned about the Marine Diesel Oil (MDO) price level from 2015 onwards. There were large variations in bunker price estimations. Notteboom (2011) anticipated that the price of MDO could increase anywhere between 25% and 200% by the year 2015. The European Maritime Safety Agency (2010) speculated in their study that the sulphur directive may cause the MDO prices to increase by as much as 60–70%. However, from 2015 onwards until present day, the bunker price has fallen dramatically, which saved both freight owners and maritime logistics from significant economic losses.

Due to environmental and health reasons, the IMO (2014) and the EP (2005; 2012) decided that sulphur emissions should be extensively lowered in European sea regions.

Therefore, SECA (stated by the IMO) can be considered as an environmental action that is expected to bring forth positive health impacts (also Svaetichin & Inkinen 2017). Latest climate studies suggest that fast changes are needed in order to achieve lower emission rates. International shipping accounts for approximately 2.2% of global CO₂ and 2.1% of global GHG emissions. In 2012, global CO₂ emissions were 35,640 Mtons and total shipping emissions were 938 Mtons, representing 2.6% of total emissions. Commercial marine operations in the SECA region produced about 40 megatons of CO₂, which was approximately 4.6% of the global marine transportation. Comparing emission factors in the SECA region between ships (20 g CO₂/ton-km) and road transport (62 g CO₂/ton-km) (Cefig 2011), marine transportation can be considered more environmentally efficient.

The SECA regulation forced the whole maritime cluster to focus on environmental issues in the Baltic Sea area. The shipping companies were also forced to lower their SO_x emissions. The primary solutions were to use either MDO or HFO and scrubber technologies. Later on, low (or even zero) sulphur solutions, such as Liquid Natural Gas (LNG), emerged. The SECA regulation's effects have been studied and analysed particularly in the BSR. The use of scrubbers and HFO also aided in the cost management control, even though scrubbers were largely seen as an unreliable old technology (e.g. Bruckner-Menchelli, 2009). Acciaro (2014) predicted that ships would use, to some extent, the more environmentally friendly LNG, but it will likely remain uncommon in the near future. Alhosalo (2013) showed based on collected data (surveyed personnel of a ship-owner) that 88% of the respondents believed their company was going to use MDO as bunker fuel starting from January 1st 2015. This is an example of anticipated cost increases in the BSR.

3. REMARK ON THE DATA COLLECTION METHODS

The following remarks are needed in order to present the collected data. The papers were collected from two well-known scientific reference databases, Science Direct (SD) and Web of Science (WoS). These two databases were selected because they are widely used and represent the academic publication journals and articles which are also peer reviewed before publication in a fairly comprehensive way. The paper search was done based on publication year (2017 and 2018, up to October) and using a query sentence "SECA, economic impacts" in the keyword search. This query produced a selection of 21 papers. It is likely that most of these papers were written and composed before the publication year. Also, the data sets applied in these papers were, to a large extent, collected before 2015. Empirical papers are, of course, always dependent on the data and its properties, defining what kind of output the analysis produces. However, it was estimated that even if the data may be missing relevant articles, the obtained collection of 21 papers is enough to give a good insight into the latest discussion concerning SECA's impacts on businesses. Empirical results will be presented in the Part 2 of the paper.

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