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MANAGEMENT AND INCREASED COSTS IN SEA TRANSPORT SHOULD PSSA BE DECLARED IN THE ADRIATIC REGION

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Abstract: The objective of this paper is to describe and evaluate the scheme of the structure of ship's voyage costs that would increase because of announcement of particularly sensitive sea area in Adriatic sea. The reasons to increase costs were listed, costs of active and passive escort, different role of the pilots in usual and regular sea area and in particularly sensitive sea area (PSSA). It has been analysed the way of announcing particularly sensitive sea area as an improving instrument of the sea protection. That action obligates to follow the law. It is being explained the conditions and characteristics of the particularly sensitive sea area. All the decisions related to garbage management in economical and ecological aspect do not increase ship's costs. Good models could bring up the savings for shipping companies, not just the costs.

Keywords: particularly sensitive sea area, PSSA, state law regulations, garbage management, pilot, transportation costs, ship's voyage costs.

1. Introduction

In accordance with IMO guidelines from 1999, specific marine areas are divided into special sea areas (according to the MARPOL Convention) and particularly sensitive sea areas (PSSA) (UNEP, 2014).

According to the definition of the IMO, particularly sensitive regions are areas of the sea that need special protection due to their recognised ecological, social, economic and scientific nature, and which are in danger from activities related to sea transport (IMO PSSA, 2016). Despite the popularity of marine reserves as a management tool, few reserves appear to have been created or designed with an understanding of how reserves affect biological factors or how reserves can be designed to meet biological goals more effectively. The basis for declaring an area a particularly sensitive area can be found in the United Nations Convention on the Law of the Sea of 10th December 1982 (MARPOL, 2005). The basis for declaring the Adriatic such an area can be found in the Protocol of Specially Protected Areas in the Mediterranean was adopted in 1982. The particularly protected areas of the Mediterranean can be declared as such due to their natural characteristics as well as their historical, cultural, aesthetic, scientific and educational significance. Size of a marine area which should be promoted to protected area does not matter (Halpern, 2003; Pacific Islands, 2014). A PSSA could be promoted as a conservation and fishery management tool (Berezansky et al., 2011)

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if the other related facts have been fulfilled. Appropriate measures must be taken in these regions such as regulating sea transport, fishing, underwater research and regulating other potentially dangerous activities in the marine area. As part of changes made to the Mediterranean system in 1995, the Protocol concerning Specially Protected Areas and Ecological Biodiversity was adopted and the 1982 Protocol was thus changed. The Protocol pertains to all marine regions in the Mediterranean regardless of their legal status. As per the decision of the members of the Protocol, areas of the sea that are under national jurisdiction, including areas of open sea, can be declared areas of special protection important for the entire Mediterranean. The decision to declare these areas as such is made by unanimously by the governments that signed the Protocol. Special areas are also foreseen by the MARPOL Convention that regulates measures for the protection of these areas from pollution caused by ships, recently updated in Annex on 1st January, 2017 (MARPOL, 2017).

The functioning of the PSSA is closely related to the prevention of oil, crude oil, crude oil derivates and chemical spills from ships, as well as the prevention of waste pollution and controlling smoke exhaustion in the atmosphere. The MARPOL Convention 73/78 in Annexes I, II and V defines a *Particularly Sensitive Sea Area* - PSSA according to the type of pollution that is covered by each of its Annexes. A PSSA in the MARPOL Convention is defined as a sea area where, for recognised technical reasons regarding its oceanographic and ecological conditions, as well as the special character of maritime transport, it is necessary to adopt special regulations so as to avoid sea pollution through oil, harmful liquids or waste. A PSSA can include the protected sea zones of more than one country or even an entire closed or semi-enclosed sea (Ünlü, 2004).

The primary aim of this article is to increase the protection of the Adriatic Sea.

In addition, the authors of this study would like to point out possible new costs for shipping companies that sail in the Adriatic Sea, in the event that it is declared a PSSA.

1.1. Reasons for the Need to Declare a Particularly Sensitive Sea Area

The Adriatic Sea is a typical oligotrophic sea, i.e. it is a sea where there are small concentrations of nutritional substances. As such, its waters are mainly clean and clear and give it a particular blue colour for which it is well known. However, because it has low quantities of nutritional salts, their increase can accelerate natural production processes that manifest into sea mucilage.

During routine sea transport or cargo transfer, ships can release various substances directly into the marine environment (Bakalar et al., 2016). Substances that pollute the sea include oil and oil mixtures, harmful liquids, waste water, waste, harmful solid substances, protective paints and lacquers, and foreign organisms. Such of pollution traces are shown on Fig. 1. Many of the aforementioned substances can permanently effect the marine environment and marine life. Pollution can also come about because of a ship accident, sinking or wrecking (Bakalar et al., 2011). If there is a lot of sea transport in a particular area with increased risk, then the local government desires that this area be declared a particularly sensitive sea area. That is a significant objective for conserving

the nations' important natural and cultural resources (Office of the Federal Register (US), 2011). This desire can also be based on the financial inability that through high quality supervision activities be forbidden by local legislation. However, other factors that have been accepted by the international seafaring community have to be examined (BalticMaster, 2010; PSSA Wadden sea, 2011). Some areas of Mediterranean importance have been promoted recently, so that could be another basement for growing up the opportunity for PSSA in Adriatic sea (SPAMI, 2014). Certain areas in Adriatic region were promoted to special protected zones (black marks in Fig. 1).

Fig. 1.
Oily Traces in Adriatic Sea (Red Traces)and Special Protected Zones (Black Marks) in Adriatic Sea
Source: Modified from (Oil traces in Adriatic, 2016; Adriatic sea map, 2017)

1.2. Possible Demands in the PSSA that Increase Total Shipping Costs

Requirements that were agreed upon and established by member countries of a particular PSSA are approved by the IMO. Upon approval, they can begin to implement the functioning of the PSSA. Certain remote monitoring for different purposes (Bakalar, 2012a; Bakalar, 2014; Bakalar, 2016a) can be implemented if member countries would agree with it. The Baltic Sea is a good example of a well established PSSA. Among other things, it is planned that surveillance be improved and done on a volunteer basis. As a model to all countries in this PSSA, surveillance of VTS (Vessel Traffic Service) is done in the Finnish Bay (Bothnia VTS, 2016).

One of the requirements when preparing a PSSA is to prepare common and united surveillance of the entire area of a PSSA in a particular sea. The advantage of developing a PSSA, e.g. the Wadden Sea, is political collaboration, which is still not quite developed to such a friendly level in the PSSA of the Baltic Sea. As such, the level of organisation achieved in the Wadden Sea has yet to be developed in the Baltic Sea. Education and increased awareness of the PSSA is also one of the requirements for

the improved functioning of a PSSA, most especially so among seafarers and the coastal authorities.

The requirements of a particular PSSA do not necessarily have to be the same in all PSSA of the world. They can refer to various natural, transport, as well as political situations in a particular area. Part of the costs that sea transport would have to pay has not been defined in terms of tariffs being designated on a worldwide basis. This depends on the skill with which each particular member country of a PSSA implements its requirements as approved by the IMO and carry out additional costs. As such, much attention is drawn in the Adriatic Sea to the changing or managing of ship's ballast water that could be contaminated by bio-invasive marine microorganisms (Bakalar, 2013). Preventative costs for this have not as yet been defined, but they will most certainly increase sea transport costs for a future, potential PSSA in the Adriatic Sea. It has been proposed that prior to sailing into a Croatian port, ballast water samples be taken and analysed in a laboratory (GloBallast, 2015). It is hard to believe that a proposal such as this will be approved by the IMO as responsibilities have not been delegated as yet and the legal consequences are numerous.

2. Increased Shipping Costs and Possible Savings in Organising a PSSA

Shipping costs include the costs of the ship while at sea, while in port and operative costs. The structure of daily shipping costs as viewed by seafarers can be broken down into the effective shipping costs, fuel costs and the cost of canal passage (gCaptain, 2017). Increased shipping costs as a result of paying for activities that have been jointly authorised by coastal countries during a ship's stay in a PSSA are unquestionable. Costs in a PSSA in the Adriatic would increase for ships that have stopped over or are sailing at sea.

Port facilities for the acceptance of waste refer to every fixed, moving or floating formation, equipment or concessionary ship adequate for the acceptance of accumulated waste or leftover cargo from a ship. There would have to be many more of these types of facilities in a PSSA in the Republic of Croatia than at present. A model needs to be found whereby waste and leftovers would no longer be thrown into the sea. This would most of all refer to extremely harmful and poisonous liquid chemicals, as well as all other types of cargo that can permanently destroy flora and fauna.

Accumulated shipping waste is all waste including faecal waters and other remains that are not remains from the shipping cargo, but was created during the ship's travels. They are part of Annexes I, IV and V of the MARPOL Convention, while accumulated cargo waste is defined by the Directives applicable by Annexes V of the MARPOL Convention. It is important that through one high quality model a way be found so that the shipping company is satisfied with the amount of defined, additional costs. However, it has to be considered that a company's loyal crew do not have the possibility of undertaking activities that could endanger natural resources (Bakalar and Baggini, 2016; Bakalar and Baggini, 2016a).

Faecal water is waste water that is defined by Regulation 1.Annex IV of the MARPOL 73/78 Convention (MARPOL, 2003). The existing international model need not be a good solution for the future PSSA in the

Adriatic Sea as closing all valves for releasing faecal water 12 miles from the nearest coast could be counterproductive. This model for managing faecal water is acceptable for the biggest passenger ships with large capacity tanks for storing faecal water on ships, but could be a bad model for smaller ships and yachts. Any new solutions will increase the total shipping costs. Without a high quality, overall solution for faecal water management, the functioning of a PSSA is as such unimaginable.

Waste management is an activity whereby the waste's composition is altered through a physical, chemical or biological process, including sorting, so as to decrease its amount and any hazardous characteristics. It is made easier through management or improvements regarding the utilisation of waste. Waste management is not paid for and should not increase the total cost of shipping. It is usually part of the overall solution regarding management of the ship's or other type of waste. Recycling is part of a waste management model where the concessionaire has financial advantages, the costs of waste management are decreased and as such, the total shipping costs are not increased. This model is used in the PSSA of the Baltic Sea, however, a lump sum is paid regardless of whether the service is used or not (PSSA Wadden sea, 2011). An even higher ecological aspect is use of waste. This is an activity whereby waste is once again used in the production process for material and energy purposes. This can all be applied in the final model for waste management in the future PSSA in the Adriatic Sea so that no increased shipping costs would be incurred with this activity. In addition, the ecological consciousness of seafarers would be on a higher level. An example of waste water treatment facility is in Fig. 2.

3. The Collection and Management of Waste Water from Ship in a PSSA

Every plant for the management and treatment of waste water has its ecological disadvantages. The plant itself is in a way a pollutant and its maintenance is necessary in accordance to the regulations of the country in which it was installed. This maintenance can also increase the cost of waste water treatment on ships.

Fig. 2.
Facility for Waste Water Treatment in Kukshaven, Germany
Source: Modified from (Waste water, 2017)

When instructions are not adhered to and regulations not respected in regards to machine operation, waste water treatment can be difficult and unpleasant odours occur. As such, besides increased operational costs due to the compulsory use of plant services, potential dangers due to various reasons have to be foreseen, as well as determining responsibilities and potential costs due to errors that may occur.

3.1. The Collection of Oily Water

The release of dirty ballast water into the sea from a ship that is allowed to haul water ballast in the fuel tank is only allowed through an oil filtration device with an alarm and automatic blocking if the oil contents are above 15 ppm (Bakalar et al., 2016). The release of dirty ballast water from a ship which is allowed to haul ballast water in the fuel tank is allowed without the use of an oil filtration device solely through collection depots on land (Bakalar, 2011; Bakalar and Baggini, 2016b). The cost of treatment is different from country to country. A good example of solving this issue is in the PSSA of the Baltic Sea. Member countries of the PSSA of the Baltic Sea have mutually, with the Helsinki Agreement and with the approval of the IMO, deemed it compulsory that a ship's waste materials (oily substances from the ship's engine room and cargo hull, bilge water, harmful substances from the cargo hull and waste materials excluding food) be released prior to leaving port. For the collection, treatment and disposal of oily waste water from the ship (engine room), no tariffs have been regulated. A principle has been introduced whereby each boat that comes into a Baltic port must pay a certain amount for the cost of treatment of collected oily water, regardless of whether they use these services or not. The cost of oily water treatment in the Adriatic comes to an average of approximately $US100 per cubic meter of oily water. Should the Adriatic be declared a PSSA, these costs could be dispersed as per the model used in PSSA of the Baltic Sea. This cost would most certainly have to be included in increased shipping operation cost in a future, potential PSSA in the Adriatic Sea.

3.2. The Collection, Removal and Treatment of Edible Oils

In some PSSA it is obligatory to collect, remove and treat edible oils and is not charged as is the management of other waste. In fact, all ships that sail into that PSSA must pay for the treatment of other oils even if they do not dispose of them. This decision, made with the approval of the IMO, has increased awareness regarding the protection of a PSSA (IPTA, 2015).

At present, the By-law for the Treatment of Waste Oils is in force in the Republic of Croatia as per the decision of the Ministry of Environmental Protection, Urban Development and Construction. This is in line with European guidelines introduced for the overall organisational system of collecting, using and treating waste industrial and edible oils. Parts of the waste oils are used as fuel in cement factories, brick factories, thermoelectric plants and in other heating plants. Almost all waste oils can be used in the production of new oils or biodiesel, as well as fuel (Knothe et al., 2009).

In the case of a PSSA In the Adriatic Sea, edible oils would most probably be treated free of charge but would have to be unloaded onto a receiving vessel, containers or would be handed over to terminals of authorised

concessionaires. Considering the fact that this oil can be used, this service would not increase total costs should a PSSA be developed, unless a decision was made otherwise. It is vital to regulate the unloading of grey water that can also contain edible oils if edible oils are not handled properly on the ship. This is particularly important for an increasing number of passenger ships that come into the Adriatic.

4. Predictions in Critical Locations and Ship Surveillance

This would include increased costs when passing through canals that were not charged for prior to the declaration of a PSSA; including pilotage, active and passive towage and passive ship surveillance during sail. All European countries allow towing so as to protect their coast. In 1994 the Bonn Agreement working group called the *Working Group for Emergency towing*, (further ETOW) defined the tasks for *Emergency towing vessels.* These tasks are called the *Role of Emergency Towing Vessels* (further ETV) (ETV, 2010). The basic task of an ETV is to prevent pollution or ecological damage foreseen as the result of a shipping accident or mechanical failure. One basic image of a catastrophe whereby surveillance begins is a incapacitated, completely filled ship transporting liquid cargo or stranded ship which, due to extremely bad weather conditions, loses part of or its entire cargo as a result of this disaster. This kind of scenario, should a PSSA be developed in the Adriatic Sea, be completely impossible or highly unlikely.

Investments in a PSSA are immense. One example is the need for reserve tugboats that can, at any given moment, take over the operations of tugboats that have broken down. These costs have to be shared among countries belonging to a PSSA and shipping companies whose ships sail and undertake shipping operations in a particular PSSA. So as to declare the Adriatic Sea a PSSA, there need to be many more tugboats than there are at present. Is environmental awareness so high that investing in the purchase of tugboats is made without saying? The current economical situation would most certainly call for finding a model whereby part of the expenses would most certainly be paid by shipping companies. However, an example from Germany and the PSSA that they belong to shows that tugboats that were initially meant to be used for ETV must now be heavily hired and are paid for their services. Savings are made by using multifunctional tugboats that are designed to undertake many activities, such as search and rescue, as well as disasters of dangerous cargo and other tasks. This approach would, in the future PSSA in the Adriatic Sea, decrease total organisational costs. Such an approach would in future PSSA Adriatic reduce the total cost of the organization and the costs which could therefore be distributed or through a good quality distribution model be paid for by the shipping company and raise the overall cost of shipping.

In the PSSA of the Wadden Sea there is a lack of ETV tugboats as there are too few of them in reserve. It has been decided that tugboats, regardless of which country or shipping yard manufactured them, should have the same characteristics and appearance so that they can be manned by crews from various countries. Crews from all countries would be changed on all ships. Regarding the number of ETV tugboats necessary, a training boat should also be calculated, as well as one

that would be used for rescue and not be in reserve. All these boats should have specific locations designated for operational areas. This example from the PSSA of the Wadden Sea is a good indicator for the Republic of Croatia regarding necessary additional organization, as well as additional costs that could affect the total cost of shipping transport in a PSSA in the Adriatic Sea.

4.1. Ship Surveillance

In addition to the costs of passing through canals, including pilotage and towing in the PSSA, there is also obligatory ship surveillance while passing which includes, in certain areas, obligatory active and passive surveillance. This ship surveillance measure, due to heightened security in shipping transport, was approved by the IMO. Heightened security is less debatable when it comes to a PSSA. The need for active or passive surveillance is dictated according to the width of a canal and the potential danger that a ship may encounter while passing through this area. A good example of tugboat surveillance can be found in the in the USA, in Prince William Sound in Alaska. Tugboat surveillance is obligatory and active and passive surveillance are interchanged, while two pilots change guard on the bridge during the passing which lasts several days. Criteria for dictating the need for surveillance is in the domain of the mutual governing bodies of a particular PSSA zone. As such, the need for surveillance can be decided based upon the strength and direction of the wind, variable sea currents, as well as the ship's devices in emergency towing or other characteristics of the ship. These are additional shipping costs as these conditions might not be able to be taken as relevant when deciding about obligatory surveillance if it does not regard a PSSA, rather, an ordinary sea area (UNESCO, 2013).

4.1.1. Passive Ship Surveillance

During passive surveillance, the tugboat joins the boat without any unwanted active contact via a tow rope. A tow rope is in reserve on the ship and the tugboat and is used only when necessary or if a tugboat is called to assist in passing through a certain area. Passive surveillance makes sense as a safety concept in sea areas where there is sufficient time to make towing contact between a ship in sail and the tugboat (European Commission, 2008).

The advantage of passive surveillance is that one ETV tugboat can provide passive surveillance and pass over into active surveillance in difficult weather conditions and when the ship is sailing at rapid speeds. It is necessary for tugboats to have the capacity to be able to tow boats of an adequate size, as well as being able to sail at high speeds. At present, even in the PSSA of the North Sea, the fleet of tugboats has not been repaired and, as such, they only have the capability to reach speeds of 14 knots and tow 70 bollard pulls. This is the reason why their use is limited and is only possible in good weather conditions. This is relevant to the Republic of Croatia taking into consideration the strong northern and southern winds that blow in the Adriatic region, but can be said to be economical should a PSSA be declared in the Adriatic Sea. The cost of shipping would rise considerably when sailing through a PSSA should passive surveillance be obligatory, as the member countries of a particular PSSA would most certainly take advantage of this possibility in all conceivably risky areas in the Adriatic Sea (UNESCO, 2013).

4.1.2. Active Ship Surveillance

During active ship surveillance, as opposed to passive surveillance, the tugboat is connected to the ship while sailing via a towing rope that is joined to both ships. The tugboat assists the ship in changing course and lowering speed, or even in towing backwards. A good example for the member countries of a particular PSSA regarding declaring a PSSA in the Adriatic Sea is the PSSA in the Wadden sea (North Sea) and the tugboats in that area (PSSA Wadden sea, 2011). It is important to note that there are no high quality tugboats in North Sea ports that can be used for active surveillance. These types of tugboats can be found in the waters of Alaska and in ports in the USA where there are many oil terminals and terminals for ships transporting chemicals. It is this fact alone that shows the high cost that the Republic of Croatia would have to pay should it wish to be fully equipped when declaring a PSSA. It is unquestionable that this cost would be charged to ships passing through the PSSA in the Adriatic Sea. Since no general price list exists, this article will cite the existing price list in the Republic of Germany, in the PSSA of the Wadden Sea. The price for active surveillance in a German port is 440 Euros/hour. Active surveillance in undertaken at very slow speeds of approximately 4 knots, whereas when the ship is sailing in a canal or other dangerous navigational area, the price depends of the speed (Common Wadden Sea Secretariat, 2010). Prices of mandatory active surveillance are in Fig. 3 and Table 1 and equivalent prices could be calculated for the future PSSA Adriatic sea.

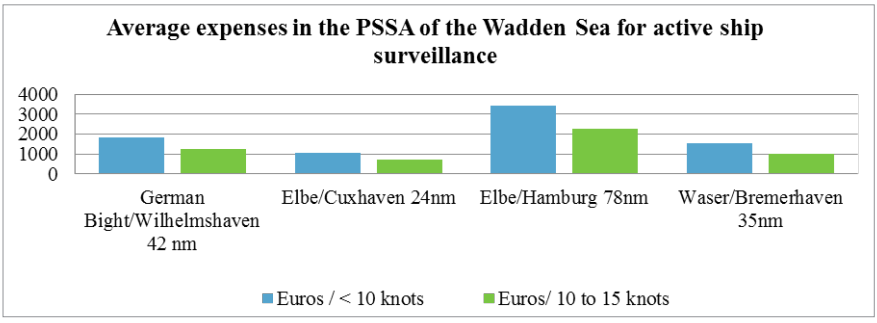

Fig. 3.
Expenses for Mandatory Active Ship Surveillance in PSSA Wadden Sea
Source: (Common Wadden Sea Secretariat, 2010)

Table 1
Expenses for Mandatory Active Ship Surveillance in PSSA Wadden Sea
Source: (Common Wadden Sea Secretariat, 2010)

From	To	Distance	Price for voyage speed up to 10 knots	Price for voyage speed from 10 to 15 knots
German Bight	**Wilhelmshaven**	42 NM	1845.- Eur	1235.- Eur
Elbe	**Cuxhaven**	24 NM	1055.- Eur	705.- Eur
Elbe	**Hamburg**	78 NM	3430.- Eur	2290.- Eur
Waser	**Bremerhaven**	35 NM	1540.- Eur	1025.- Eur

5. Joint Exercises and Training

Raising the training and educational standard is a requirement that was also made compliant in the PSSA of the Baltic Sea, and would also be an imperative in the PSSA of the Adriatic Sea. In addition to the existing and conventional requirements of mandatory and joint training for seafarers (Bakalar, 2011a), the existence of a PSSA demands the need for handling crisis situations and potentially crisis situations that should be undertaken in simulators. Some examples of training that seafarers would have to undertake are manoeuvring in crisis situations, light signalization in case of emergency on the ship and from the ship, as well as light the ship itself in these situations. Joint exercises and education in a simulator would also train personnel in making mutual decisions regarding measures taken in rescue situations or in any other crisis situation would include the participation of local rescue services, the coast guard, the national and regional authorities, the ship's crew and the PSSA control centre. Since the Baltic Sea does not have the same coordination as the PSSA of the Wadden Sea, the control centre cannot have a commanding role and this is why joint training is necessary. This is still to be regulated in the Adriatic Sea.

6. Pilotage of Ships in the PSSA

This is an area of significant profit for every coastal authority in a PSSA, wherever a reason for obligatory pilotage can be found. However, this has to also be accepted by the IMO prior to implementation in the working system. Pilotage is related to ship surveillance, either passive or active, when passing through and entering a port. It is most certainly the case that the presence of a pilot on the ship is a vital safety component in the protection of a PSSA. The pilot not only assists the ship's commander in navigating and identifying the area of sailing, but can also conduct communication with the Transport Supervisory Centre should they feel that it is necessary for safety reasons. The pilot should have a senior role in the PSSA and should be part of the management organisation in case of a disaster, as well as inform regarding the actions taken and the time that tasks were done as given by the Centre in cases of potential disasters. The price of pilotage is usually not reliant on the size of a ship and is relatively low considering the benefits of pilotage. In areas where pilotage is not obligatory, it is possible (and it is usually a possibility that all ship commanders take advantage of) that due to familiarity with the area of sailing and the large number of passages undertaken by certain captains, pilotage is not obligatory and the captain of the ship is given the right of passage respecting the captain's request. This possibility will most probably be abolished as a PSSA does not allow this. This will increase the total cost of shipping and increase pilotage profits from coastal countries belonging to a PSSA. In the PSSA of the Wadden Sea, occasional verifications are made to see whether measures that were agreed upon to decrease the cost of pilotage have decreased safety and other measures that were agreed upon for increasing safety (Common Wadden Sea Secretariat, 2010). Equivalent prices, as shown in Fig. 4 and Table 2, could be calculated for future planning of PSSA Adriatic sea.

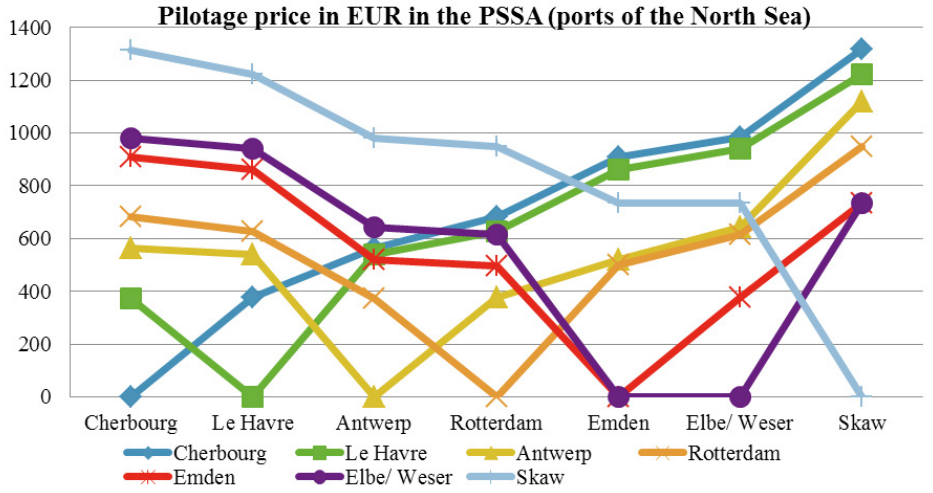

Fig. 4.
Prices for Mandatory Pilotage in PSSA (Ports in the North Sea)
Source: (Common Wadden Sea Secretariat, 2010)

Table 2
Prices for Mandatory Pilotage in PSSA (Ports in the North Sea)
Source: (Common Wadden Sea Secretariat, 2010)

Prices of pilotage in PSSA (ports in the North Sea)	Cherbourg	Le Havre	Antwerp	Rotterdam	Emden	Elbe/ Weser	Skaw
Cherbourg		374 Eur	563 Eur	683 Eur	908 Eur	982 Eur	1,314 Eur
Le Havre	375 Eur		538 Eur	626 Eur	860 Eur	939 Eur	1,221 Eur
Antwerp	563 Eur	538 Eur		374 Eur	520 Eur	642 Eur	982 Eur
Rotterdam	684 Eur	627 Eur	375 Eur		497 Eur	613 Eur	948 Eur
Emden	909 Eur	861 Eur	520 Eur	498 Eur			735 Eur
Elbe/Weser	984 Eur	941 Eur	643 Eur	614 Eur	375 Eur		735 Eur
Skaw	1316 Eur	1223 Eur	1120 Eur	950 Eur	736 Eur	736 Eur	

7. Management of a PSSA in the Adriatic Sea

The institution that would suggest laws in accordance with existing and agreed upon international conventions that would be passed in a PSSA in the Adriatic Sea would be the Ministry of the Sea (Ministry of the Sea, Transport and Infrastructure, 2017). Upon passing suggested laws in the Parliament of the member countries of PSSA, it would mandatory to determine local institutions that would authorise and control the compliance of laws in the real world. As certain government institutions already undertake similar tasks in the Republic of Croatia, it would favourable that these tasks be then done by these institutions. This

would be possible with certain activities, but is not at the level needed for the functioning of a PSSA. Some innovations related to a few ways of surveillance could be implemented (Bakalar, 2012; Bakalar, 2015; Bakalar, 2016). For some activities, a tender would have to be issued and the most credible and economic offer be chosen. For example, active and passive ship surveillance, as well as pilotage would be undertaken by existing pilotage services in cooperation with a more extensive new fleet of tugboats with the addition of ETV tugboats. In the chapter regarding Joint training and education, the experiences of the PSSA in the Baltic Sea are mentioned. These experiences could also be used in the member countries of this PSSA. As such, joint training for management in crisis situations could be organised and done by the Coast Guard and the staff of the VTS, in cooperation with the ship's crews. Forecasts in critical locations and transport surveillance have been implemented in the Republic of Croatia only recently and in its initial phase have been functioning well.

Through issuing tenders, concessionaires for the collection, removal and treatment of edible oils, waste, oily and ballast water could be determined. Facilities for the treatment and disposal of these hazardous substances have to be built with the financial assistance of the Governments of the member countries. As this would be an advanced ecological project, financial assistance could also be expected from EC and EU funds. After this, the issue of a tender would allocate a concession to the most credible, economic and outstanding concessionaire. In choosing a concessionaire, existing laws have to be considered which could hinder choosing the highest quality potential vendor who applies for the tender. The law should be accommodated so as to choose the highest quality concessionaire, but not in terms of preference and manipulating the true goals. Small companies that would receive a concession would have to prepare a business plan which would include an analysis of all facts and figures regarding the organization, insurance, accounting and legal implementation plan (Siropolis, 1997). All future concessionaires, as well as government institutions that would be responsible for and operational regarding the aforementioned activities, would be answerable directly to the Ministry of the Sea, Transport and Infrastructure of the member countries of the PSSA, should an Agency for the Management of the PSSA not be defined, which would be a part of the aforementioned Ministry.

Costs that would be incurred in the declaration of a PSSA in the Adriatic Sea should not be subject to political changes in the member countries. They should be determined in fixed amounts and be very well controlled. The best form of payment control would be via electronic reports sent immediately after completed or requested payments. Through immediate and automatic traceability, any improper billing and irregularities would be avoided. For example, in making payments for the treatment of black waste water from a passenger ship, the exact time that the services were undertaken are automatically sent to the Ministry's Control Centre or the Agency for Control. In opening emails in one location, information would automatically be sent to another location and this information would initiate the next procedure. As such, any irregularities in traceability would quickly be eliminated so as to maintain the credibility, professionalism and correctness of a future PSSA in the Adriatic Sea. Naturally, price compliancy would have to be determined

in the entire zone and in agreement with all member countries of the PSSA of the Adriatic Sea. Just as in other PSSA in the world, all new situations would have to be considered and analytically examined so as to avoid differences in attitudes, prices, payment and information. A joint PSSA Centre for all member countries should be properly managed and be familiar with any possible irregularities in the management of the tasks of any member countries.

8. Conclusion

The criterion that has to be reached in declaring a PSSA has as yet not been reached in the Republic of Croatia. The development of specialties, independence, economical benefits, as well as research on a scientific level, such as studies regarding surveillance and constant educational development are still necessary. On this very long road, finding a good quality model for the treatment of waste, crisis situations, as well as the prevention of disasters, a future PSSA in the Adriatic Sea can be shown to be a friendly area in which shipping costs do not necessarily have to increase in all segments. The total cost of shipping will most certainly rise once a PSSA is declared in the Adriatic Sea, but with a public and private partnership, some costs can be avoided and a better picture painted of each of the member countries as credible and competent countries. In their plans of achieving a PSSA in the Adriatic Sea, a successful savings model would assist the Republic of Croatia in terms of the IMO declaring a PSSA. However, cost-effectiveness and efficiency of PSSA is large and generally vague. As such, only when the economy developments can it be expected that the government take more costs on themselves that, in the case of a PSSA in the Adriatic Sea, will have to be paid by shipping companies. In particular, waste treatment might not be part of shipping costs which would, from a marketing point of view, be extremely positive, as well as being environmentally friendly.

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