TRANSNAV
http://www.transnav.eu
the International Journal
on Marine Navigation
and Safety of Sea Transportation
Volume 7
Number 3
September 2013

DOI: 10.12716/1001.07.03.05

The effectiveness of maritime safety policy instruments from the Finnish maritime experts' point of view – case Gulf of Finland and prevention of an oil accident

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ABSTRACT: Sea accidents are aimed to be prevented with an extensive amount of maritime safety regulation. The purpose of this paper is to present the findings of a questionnaire study that was targeted at Finnish maritime experts and addressed the question: how to prevent an oil accident in the Gulf of Finland. This study also includes a literature study about the problems of the current maritime safety regime. The findings of the questionnaire study are compared to the findings of the literature study. The questionnaire study showed that many kinds of policies have improved maritime safety, and they are needed to ensure maritime safety. For instance, ship construction, fairway maintenance, nautical charts and rules of the road at sea can be considered the cornerstones of maritime safety. However, the results ranked voluntary activities of companies as the most effective way to improve maritime safety in the future. Self-regulative approaches could solve some problems connected to more traditional policy-making.

1 INTRODUCTION

Safety at sea is aimed to be enhanced by extensive safety regulation. The range of maritime safety regulation is wide; it ranges from legal and regulatory instruments to economic instruments and information sharing based instruments. Additionally, regulatory and other maritime safety actors are numerous. Of them the International Maritime Organisation (IMO) is the most prominent, but also other international, regional and national actors play their role.

There has been a remarkable increase in maritime transportation, and the transportation of oil in particular, in the Baltic Sea in the 2000´s. Over the last ten years, the volume of oil and oil products transported has tripled in this area. The main reason for the increase in maritime oil transportation volumes in the Baltic Sea is Russia`s new oil terminals in the eastern part of the Gulf of Finland. The Port of Primorsk started operating in 2002, and other ports have increased their capacity as well. Oil terminals in the port of Ust-Luga started operating in March 2012.

In 2010, almost 290 million tonnes of oil and oil products were transported in the Baltic Sea, of which more than 55% via the Gulf of Finland (Holma et al. 2012). Every day, more than 2,000 ships are sailing in the Baltic Sea, and 25% of these are tankers. (HELCOM 2009) The shallow and rocky waters, narrow channels and severe ice conditions add to the risks of navigation in the Baltic Sea and, more particularly, in the Gulf of Finland. The relatively small sea areas, crossing traffic between Helsinki and Tallinn and oil tankers going to the west from the eastern part of the Gulf of Finland are a combination which can cause a disaster both for humans and environment.

The focus in this paper is to establish how to prevent an oil accident in the Gulf of Finland. The

paper presents the findings of a questionnaire study that was targeted at Finnish maritime experts. The questionnaire study was done as a part of a project focusing on the risks of maritime traffic in the Gulf of Finland in the Baltic Sea. In the questionnaire study wide range of different policy instruments and their effectiveness in the past and in the future were compared.

Previously accident risks and accident probabilities and their environmental consequences in the Gulf of Finland have been studied by using Bayesian belief networks (BBNs) e.g. in Hänninen 2011; Mazaheri et al. 2013; Hänninen et al. 2012; Hänninen and Kujala 2012. Environmental impacts of shipping and oil accidents on the environment in GoF have been studied by e.g. Lecklin et al. 2011; Ihaksi et al. 2011; Helle et al. 2011; Lehikoinen et al. 2013. This paper complements the previous research by focusing on the societal view: how to prevent an accident from happening.

The structure of the paper is as follows. In chapter two, maritime safety policy instruments and some examples of evaluation methods and studies are presented. Also the general critique of the maritime safety policy system is reviewed. In chapter three, the method of the questionnaire study is presented. Chapter four presents the results of the questionnaire study. Chapter five provides the conclusions and discussion of the results. In the conclusions, the results of the questionnaire study are mirrored to the findings presented in chapter two.

2 MARITIME SAFETY POLICY INSTRUMENTS AND THEIR EVALUATION

Policy instruments are often divided into regulatory, economic and information guidance based instruments (e.g. Klemmensen et al. 2007; Vedung 2003; Vieira et al. 2007; Kuronen and Tapaninen 2010). Other classifications of policy instruments exist as well, based on for example the degree of governmental power or the carrot/stick categorization (Vedung 2003). Regulatory instruments include for example jurisdiction and law based decrees, restrictions and licences; economic instruments taxes, subsidies, fees etc.; and information-based guidance information, voluntary education, certification, awards etc.

Policy instruments can be viewed from the perspective of the interests that they aim to protect: private goods (e.g. the competitiveness of companies) or public goods, which the market would otherwise neglect (e.g. the maintenance of safety and security in the shipping industry and protection of the environment from the harmful effects of shipping). Policy instruments can be either preventive measures (e.g. regulation on the construction of ships or vessel traffic services), or sanctions (e.g. criminal responsibility) and consequences (e.g. financial liability). Both preventive measures and consequences can be either private (e.g. insurance) or administrative measures (e.g. prohibitions). All the instruments are not necessarily based on jurisdiction. Private actors can also act in co-operation and promote maritime safety related goals, for example in P&I Clubs (Protection & Indemnity Clubs). (Kuronen and Tapaninen 2010)

In addition to traditional governance, new forms of self-regulative governance have emerged especially in environmental governance, including, for example, self-governance, network governance, interactive governance or co-governance (Kern 2011; van Leeuwen and van Tatenhove 2010; Wuisan et al. 2010). This shift has introduced new actors into elements of policymaking and has resulted in new practices which challenge, transform and complement the traditional ways of policymaking. Globalization and individualization are seen as catalysts in this shift (van Leeuwen and van Tatenhove 2010).

Effective policy instruments should be coherent with overall policy orientations. A certain set of policies can together be more effective than any single policy would be. In their study on transport policy instruments, Vieira et al. (2007) found that most of the policy instruments studied had positive synergy effects, i.e. the effectiveness of instruments implemented together is potentially greater than the effectiveness of each instrument separately. It is also important to look at which current policies might provide conflicting incentives and which should be removed. Policy instruments should also be reviewed in the context of maritime shipping system changes. (Greiner et al. 2000; Vieira et al. 2007; Walker 2000)

2.1 *Formal Safety Assessment and other evaluations of maritime safety policy instruments*

IMO has developed the Formal Safety Assessment (FSA) method which can be used as a tool to evaluate regulations for maritime safety and to make comparisons between existing and new regulations. FSA is based on five steps which are: identification of hazards; assessment of risks, identification of risk control options (RCOs), cost-benefit analysis of RCOs and recommendations to decision-making after the analysis (IMO 2007).

During the years FSA has been in use in IMO, many FSA analyses have been submitted to IMO addressing specific cases (e.g. MSC/83/21/1 2007; MSC/83/21/2 2007; MSC/83/INF.8 2007; MSC/85/17/1 2008; MSC/85/17/2 2008). There are many examples on how the FSA method has been used in the analysis of maritime safety, e.g. in the evaluation of containership safety (Wang & Foinikis 2001), in the evaluation of cruise ship safety (Lois et al. 2004), in the development of risk-based rules for offshore crane systems (Ruud and Mikkelsen 2008), or in the analysis of the risk of LNG carrier operations (Vanem et al. 2008). However, many of these studies focus more on risk assessment issues than on ranking of RCO's.

A collection of FSA studies done in the Baltic Sea area has been published in 2010 (Westerlund 2010). Westerlund (2010) concludes that FSA studies have mainly been concerned with risks of oil spills in the Baltic Sea as a consequence to grounding or collision accident. Some of the cited studies developed RCO's during the FSA process and some evaluated the proposed RCO's. The most common RCO's analysed were traffic separation schemes and VTMIS (Vessel

Traffic Management and Information System). (Westerlund 2010)

Some studies focus on evaluating the FSA methodology and also criticize it (Rosqvist & Tuominen 2004; Kontovas & Psaraftis 2009; Psaraftis 2012; Puisa & Vassalos 2012). For example, FSA studies have been criticized for lacking transparency of used data or utilizing constricted or unreliable data; also the methods used (e.g. of cost-benefit analysis or ranking of RCO's) have been criticized (Psaraftis 2012; Puisa & Vassalos 2012). Despite of deficiencies in its practical applications, the FSA method is used widely in the evaluation of maritime safety risks and policies. The FSA system has provided a common framework for maritime safety policy evaluation, but inside the FSA framework different methods for risk assessment and policy evaluation can be used.

Besides FSA studies, there are also other examples of evaluation of maritime safety policy instruments. Walker (2000) has analysed in his study the costs and benefits of a range policy options for maintaining or improving safety in the North Sea. Walker (2000) has used in the policy evaluation an approach which was developed by a research institute called RAND Europe. In the study, 9 different "tactics" to prevent an accident in the North Sea were identified. Tactics were connected for example to traffic routing, VTS, piloting, waterway marking or contingency planning and SAR services. (Walker 2000)

Hawkins (2001) has studied effective measures to improve the quality of shipping in the Asia Pacific Region. According to the survey results, the most effective mechanisms in improving the safety of shipping in the Asia Pacific Region were port state control, ship vetting, ISM Code implementation, industry self-regulation, government-industry partnerships, a regional approach and a stronger Asia Pacific voice and media coverage and information exchange (Hawkins 2001).

In their study, Marlow & Gardner (2006) perform cost-benefit analysis for the development of marine electronic highway (MEH) in the Straits of Malacca and Singapore. The MEH is a type of information superhighway that integrates maritime safety technologies and environmental management systems, and which is based on electronic navigation charts (ENC). Their analysis is based on economic cost-benefit analysis (Marlow & Gardner 2006).

2.2 *The general critique of maritime safety policy*

Several authors have criticised the prevalent maritime safety regime which mainly consists of command-and-control type policies (Goss, 2008; Goulielmos, 2001; Knapp and Franses, 2009; Knudsen, 2009; Mitroussi, 2004; Psaraftis, 2002; Roe, 2008, 2009).

Extensive maritime safety regulation is in place, ranging from the international level (International Maritime Organization, IMO) to the supranational (e.g. European Union), the regional (e.g. HELCOM) and the national levels. Several measures have been adopted, and new measures are continuously being developed and proposed to prevent sea accidents. Although the goals are good, there is a risk of the shipping industry being encumbered with excessive rules and extra costs, which in the end will do little to decrease accident risks (Kuronen and Tapaninen, 2010).

The current governance system of the maritime industry has been criticised for being reactive. In many cases, major accidents have activated the renewal of international maritime safety regulations, for instance SOLAS and MARPOL Conventions and OPA 90 regulations. This kind of 'post-accident' policy is often not very comprehensive, and one particular risk gets too much attention (Goulielmos, 2001; Knapp and Franses, 2009).

Maritime safety regulation focuses very much on technical aspects, while it is a commonly repeated statement that the human factor is the most important cause of maritime accidents (Kujala et al., 2009; Trucco et al. 2008). IMO has recognised the importance of safety culture and human factor in maritime safety (IMO 2012), but it seems that it is difficult to find or implement effective measures to reduce the role of the human factor in accident causation (Kuronen and Tapaninen 2010).

The implementation of international jurisdiction is based on flag states, and flag states have very different standards for implementing regulations. According to Knudsen and Hassler (2011), there are inconsistencies and 'conflicts' concerning the inspection practices, interpretation of rules and implementation strategies between flag states. This enables unfair competition in the shipping business (Goss, 2008).

Knudsen (2009) has concluded that the continuously increasing amount of safety regulation and the administrative workload of maritime personnel have induced aversion against new rules and regulations among seafarers. The seafarers believe that the increasing volume of regulations, controls, and administrative work has negatively affected the safety onboard. Moreover, the seafarers feel that this trend belittles their seamanship, which is a blend of professional knowledge, professional pride, and experience-based common sense (Knudsen, 2009).

Finally, one major problem of maritime safety regulation results from the fact that national representatives make up IMO, which leads to constructing maritime policies for the globalised industry from a national perspective. Problems arise when national interests conflict with maritime safety goals. Many times this is manifested in the slow pace of the IMO legislation process. In addition, maritime safety jurisdiction does not match the geographical extension of the corresponding economic activities. The administrative units that implement the safety rules and regulations can only act at the national level, while the shipping industry acts at the global level (Furger, 1997; Roe, 2008, 2009).

3 METHOD

3.1 *The questionnaire study*

The aim of the questionnaire study was to find out how to improve maritime safety in the Gulf of Finland. In particular, the purpose was to find out how maritime experts viewed the effectiveness of different preventive maritime safety policy instruments, and how they thought maritime safety, with focus on the Gulf of Finland, could most effectively be improved. The questionnaire was based on the previous literature review (Kuronen and Tapaninen, 2010) on the effectiveness of maritime safety policy. The aim of the questionnaire study was to test the conclusions of the literature study empirically. How do Finnish maritime experts view the regulatory, economic and information guidance based policy instruments in comparison with each other, and how do they think an oil accident in the Gulf of Finland could be prevented?

The questionnaire study was carried out in Finnish using the web-based system 'Webropol' (http://w3.webropol.com/) between February and March 2010. Two different ways to fill in the questionnaire were used: an open questionnaire on the Internet or an e-mail questionnaire that was sent to selected respondents. The two questionnaires were the same, except that the open questionnaire contained a few more questions concerning the background of the respondents.

The questionnaire study was targeted at Finnish maritime experts including seafarers, pilots, maritime authorities, representatives of maritime education, classification societies, marine insurers, the Coast Guard, sea rescue and other related organisations in Finland.

An e-mail invitation was sent to 175 persons whose contact details were obtained from the Internet, from the customer register of the Centre for Maritime Studies or through the researchers' personal contacts and information. In the selection of potential respondents attention was paid to an even distribution between different respondent groups. In addition, information concerning the open questionnaire was sent to four Finnish trade unions involving ship officers, seamen, engine officers and pilots. Information about the questionnaire was also disseminated in meetings, seminars and conferences related to shipping during the time the questionnaire was available on the Internet.

A total of 96 persons filled in the questionnaire. 63 of these responded to the e-mail questionnaire and 33 to the Internet questionnaire. The distribution of the respondents was as follows:

- Seafarers 24%
- Maritime authorities 13.5%
- Maritime education 12.5%
- Shore-based employees of shipping companies 11%
- Pilots 19%
- Others 24%

Seafarers were the largest group with 24% of the respondents. The second largest was the group 'Others' (20%). The group 'Others' contained many respondents from several sectors that could not be treated as separate groups due to the small number of respondents in each sector, e.g. sea rescue or classification societies. The third largest group was pilots with 19%.

Of those who received an invitation to the e-mail questionnaire, seafarers were the most active group to respond (54 % filled in the questionnaire). In addition, over 50 % of pilots and maritime education personnel filled in the questionnaire. The least active group (compared to the number of e-mail invitations) was "other personnel" with a completion rate of 24 %, but on the other hand, the number of selected respondents belonging to this group was the highest (67 persons). It should also be noted that pilots were active in answering the open questionnaire on the Internet. Out of 33 respondents, 15 were pilots. Pilots can be considered to be over-represented in the results, which was reflected in the questions about pilotage and in the number of free-text comments dealing with pilotage issues.

Regardless of their current position, most of the respondents had long experience in seafaring. Almost one half of the respondents, or 48%, had seafaring experience of over 15 years, and 16 had 10-15 years. Only 13 respondents (14%) had no seafaring experience, but 7 of these had over 15 years of experience in working in the maritime sector. The rest (6 respondents) had less than 10 years of experience in working in the maritime sector. It emerged that some of the respondents with relatively little seafaring experience, for example 1-5 years, had a long experience in other jobs related to the maritime industry. Overall, the respondents can be estimated to have a good knowledge of seafaring and the maritime industry based on long experience in the sector.

The Finnish shipping industry (Trafi, 2012; Sundberg, 2011) consists of approximately 25–30 shipping companies. The number of ships registered to Finland and operating in foreign traffic has, in recent years, been approx. 110-120 ships, the total gross tonnage at the end 2011 being approximately 1,400,000 t. Some of the ships owned by Finnish shipping companies are registered under foreign flags, or the shipping companies use chartered ships. All the major sectors of the shipping business are represented in the Finnish shipping industry. Dry cargo ships and ro-ro cargo ships form about half of the Finnish ships that operate in foreign traffic. The maritime traffic in the Gulf of Finland and in the Baltic Sea is, to a large extent, feeder traffic from and to European ports and only few Finnish shipping companies operate worldwide.

3.2 *Analysis*

A structured questionnaire was chosen as the main method of this study. However, the results were analysed in a qualitative manner due to the relatively low number of respondents (96). The respondents were asked to evaluate whether they thought the existing regulations/practices had been effective in improving maritime safety, and secondly they were asked to evaluate whether they thought that further development of regulations and practices could improve safety in the future with the focus on the

Gulf of Finland. The respondents could choose between five options in their answers: 'I disagree strongly', 'I disagree partly', 'I agree partly', 'I agree strongly', and 'no opinion' (Likert Scale). The respondents were directed to choose the option 'no opinion' when they consider that they are not familiar with the issue of the question. The respondents were obliged to answer all questions as it was not possible to move forward in the web questionnaire without answering. In all issues, the respondents were also given the opportunity to write freely worded comments. The freely worded comments were utilised in the interpretation of the results.

The policies and practices involved in the study are listed in the following Table 1. The purpose was to compare different regulatory, economic and information guidance based policy instruments, of which the regulatory instruments are the most prominent ones for the regulation of maritime safety. In other words, all the policies and practices that were included in the questionnaire are not based on public jurisdiction, but also instruments that are used between private partners, such as P&I Clubs, were part of the study.

Table 1 The policies and practices

Public policies and practices	Private policies and practices
Ship construction and equipment (SOLAS)	Vetting inspections
Public control of ship conditions (flag state control, port state control and host state control)	Towing
Competence of seafarers and manning of ships (STCW)	Marine insurance
Working and employment conditions of seafarers (ILO, STCW, national regulation)	P&I Clubs
ISM Code (SOLAS)	Spontaneous activity of companies
VTS (SOLAS)	
Ship reporting systems GOFREP (agreement between Russia, Finland and Estonia)	
Traffic separation schemes and routing (COLREG, SOLAS)	
Piloting (national regulation)	
Fairway maintenance (SOLAS, IALA)	
Nautical charts (SOLAS, IHO)	
Information sharing about navigation conditions (SOLAS)	
Fairway and port dues (national regulation)	
Economic incentives (national regulation)	
Liability for oil damages (CLC)	
Culpability and sanctions in oil damages (maritime law)	
Information about safe shipping (IMO, maritime authorities,etc.)	

Analysis of the results of the questionnaire study was carried out in three phases. Firstly, the distributions of the responses for each question were calculated. Secondly, the policies were ranked based on the calculated means of the responses. In order to calculate the mean values, the numeric values were set from 1 – 4 for the option of 'I disagree strongly', 'I disagree partly', 'I agree partly' and 'I agree strongly'. The option of 'no opinion' was not taken into account. The reference value was set to three, which means that over 50% of the respondents agreed either partly or strongly that a policy or practice is effective.

All of the results were analyzed together and the different respondent groups have been merged. The distributions of responses by different respondent groups were calculated, but it turned out that the distributions between different respondent groups were rather similar, and the difference in response distributions between different respondent groups was in many cases only either one or two respondents.

4 RESULTS

A summary of the responses is presented in the following table (Table 2). The distributions of answers of 'I agree partly' and 'I agree strongly' as well as 'I disagree strongly' and 'I disagree partly' answers are added together. The calculated means of the responses for policies are also presented in the table.

Table 2. Summary of the responses

Safety Policy	Past Effectiveness Percentual Distributions				Future Potential Percentual Distributions				Freely worded comments
	No opinion	Disagree	Agree	Mean	No opinion	Disagree	Agree	Mean	
Spontaneous activity of companies	3,1	7,3	89,6	3,5	5,2	3,1	91,7	3,6	11
Information about safe shipping	9,4	7,3	83,3	3,2	13,5	6,3	80,2	3,3	9
Economic incentives	16,7	13,5	69,8	3,1	14,6	10,4	75,0	3,2	10
Culpability and sanctions in oil damages	16,7	29,2	54,2	2,8	19,8	15,6	64,6	3,0	14
Liability for oil damages	21,9	17,7	60,4	2,9	25,0	9,4	65,6	3,2	7
P&I Clubs	41,7	16,7	41,7	2,8	47,9	8,3	43,8	2,9	3
Marine insurance	32,3	20,8	46,9	2,8	36,5	14,6	49,0	2,9	5
Fairway and port dues	35,4	36,5	28,1	2,3	34,4	20,8	44,8	2,7	11
Information sharing about navigation conditions	6,3	1,0	92,7	3,5	10,4	7,3	82,3	3,5	17
Nautical charts	3,2	3,1	91,7	3,6	14,6	6,3	79,2	3,4	13
Fairway maintenance	6,3	4,2	89,6	3,6	11,5	4,2	84,4	3,5	12
Towing	15,6	21,9	62,5	2,9	18,8	12,5	68,8	3,1	19
Piloting	16,7	20,8	62,5	3,0	17,7	5,2	77,1	3,4	23
Traffic separation schemes and routing	9,4	7,3	83,3	3,4	10,4	6,3	83,3	3,4	12
Ship reporting systems	16,7	27,1	56,3	2,8	21,9	18,8	59,4	3,0	15
VTS	10,4	19,8	69,8	3,0	12,5	12,5	75,0	3,2	28
Safety management - ISM Code	6,3	18,8	75,0	3,0	10,4	11,5	78,1	3,2	20
Working and employment conditions of seafarers	13,5	28,1	58,3	2,7	15,6	6,3	78,1	3,3	19
Competence of seafarers and manning of ships	7,3	25,0	67,7	2,9	10,4	8,3	81,3	3,3	26
Vetting inspections	30,2	14,6	55,2	3,0	35,4	12,5	52,1	3,0	16
Public control of ship conditions	6,3	13,5	80,2	3,2	6,3	8,3	85,4	3,3	24
Ship construction and equipment	3,1	3,1	93,8	3,5	8,3	4,2	87,5	3,3	22

In almost all of the questions about the past effectiveness of existing regulation or practices, over 50% of the respondents chose either 'I agree partly' or 'I agree strongly'. Only in the questions about fairway and port dues, marine insurance and P&I Clubs was the share of 'I agree partly' or 'I agree strongly' answers less than 50%. The question about the fairway and port dues stands out from the other questions with the largest number of both 'I disagree strongly' and 'I disagree partly' answers, and the lowest number of both 'I agree partly' and 'I agree strongly' answers.

Ship construction and equipment, fairway maintenance, nautical charts, traffic separation schemes and routings, and voluntary activities of companies are the questions to which nobody answered 'I disagree strongly' and very few answered 'I disagree partly'. Nautical charts produced the highest number of 'I agree strongly' answers. Information about safe shipping elicited the highest number of 'I agree partly' answers. The widest distribution of answers is found in the 'fairway and port dues' question. The lowest numbers of 'no opinion' answers were given in the questions concerning 'ship construction and equipment' and 'voluntary activity of companies', and the highest number of 'no opinion' answers was given in 'P&I Clubs'. The distributions of responses for past effectiveness are presented in the following figure (Figure 1)

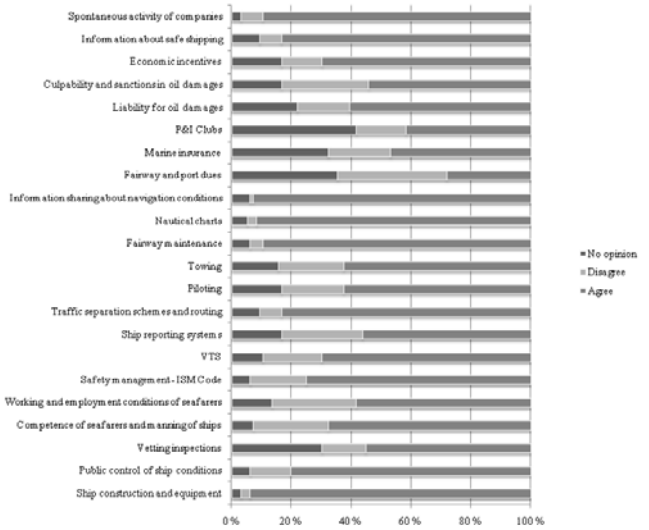

Figure 1. Past effectiveness of the policies

In the questions about the potential of different kinds of policy instruments to improve maritime safety in the future, the majority of the respondents also chose either 'I agree partly' or 'I agree strongly'. Additionally, in this case, fairway and port dues, marine insurance and P&I Clubs elicited the smallest share of 'I agree partly' or 'I agree strongly' responses, and the respondents thus did not seem to have much faith in their potential to improve safety at all.

The question about the voluntary activity of companies stands out, because of all the questions it elicited the lowest number of 'I disagree strongly', 'I disagree partly' and 'I agree partly' answers and the highest number of 'I agree strongly' answers. The highest number of 'I agree partly' answers was produced by the question concerning 'ship construction and equipment', reflecting the fact that regulation of ship structure and equipment will also be a cornerstone of maritime safety policy in the future. Ship construction and equipment also produced the lowest number of 'I disagree partly' answers, which also underlines the importance of this issue in maritime safety policy.

'Competence of seafarers and manning of ships', 'working and employment conditions of seafarers', 'traffic separation schemes and routing', 'fairway maintenance', 'nautical charts' and 'information sharing about navigation conditions' are questions in which nobody disagreed strongly and few disagreed partly, and thus these issues will be very important for maritime safety in the future.

The lowest number of 'no opinion' answers was produced by the questions about 'voluntary activities of companies' and the highest number by 'P&I clubs'. In all, the highest number of 'no opinion' answers was elicited by the questions that dealt with issues that are not present in everyday shipping, such as P&I Clubs. The widest distribution of answers was found in the question about 'fairway and port dues'. The distributions of responses are presented in the following figure (Figure 2).

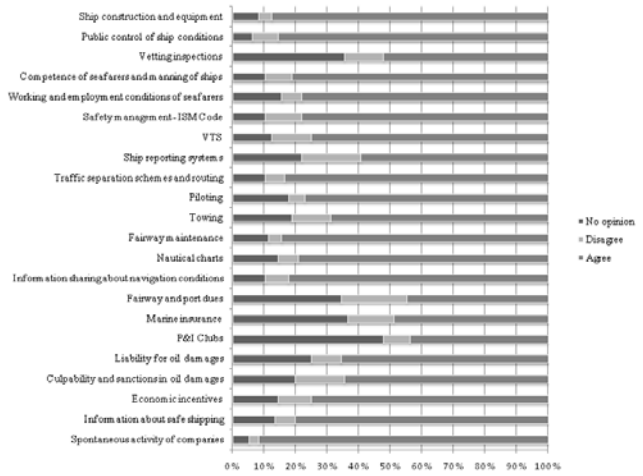

Figure 2. Future potential of the policies

The respondents gave 338 freely worded comments in total. In general, the freely worded comments in many questions tended to be quite critical towards existing regulations, which often was in contrast to responses given in the multiple choice question on the matter; e.g. a respondent had selected 'I agree partly' with the fact that regulation has improved safety, yet included a very critical freely worded comment about the regulation in question. It should also be noted that people who had something to criticise were probably more likely to write freely worded comments than others.

The question concerning the VTS inspired the highest number of freely worded comments (28) (see Table 3). The respondents suggested that the VTS centres should operate more like an air traffic control service. In addition, cooperation between VTS centres and other actors (pilots, administration and ship officers) should be developed. Pilotage inspired a relatively large number of comments (23), and mostly the comments dealt with the recent developments of the pilotage organisation in Finland.

Competence requirements of seafarers and manning of ships (based on STCW regulation) got 26 freely worded comments. According to these comments, young seafarers should have more practical experience before they are promoted as deck officers. In addition, the minimum requirements for manning were considered too small, which has lead to a situation where, for example, resting periods are violated. Fatigue of seafarers was considered a major risk for maritime safety. The freely worded comments concerning employment and working conditions of seafarers (19 comments) were also similar to those in the question of competence requirements of seafarers and manning of ships. Shifts were considered too long, and resting hours are violated in many cases. Competence requirements are too diverse between flag states.

Public controls of ship condition (24 freely worded comments) raised strong criticism due to overlapping inspections and incompatibilities of the inspecting officers. According to the respondents, the inspections should be based on a similar interpretation of the standards and other requirements. Similar comments were given on vetting inspections, which got 16 freely worded comments. Both positive and critical comments were given about the vetting inspections.

On one hand, it was stated that vetting inspections have created the real requirement level of safety for the tanker sector and improved safety by focusing on important issues. On the other hand, vetting inspections were criticised for overlapping with other inspections and that companies want to get 'results' from vetting inspections and deficiencies are looked at with a magnifying class.

Comments about the ISM Code (20 comments) brought out similar criticism as in the above-mentioned comments about inspections. The ISM audits should be developed because there have been problems with the uniform interpretation of the requirements. The safety management systems based on the ISM Code were considered too detailed, and the documentation does not correspond with the actions. Some commented that the ISM Code has added paperwork but done little to improve safety.

Voluntary activity of companies got 11 freely worded comments. According to the respondents, voluntary improvement is the most effective way to improve safety, but it often requires economic resources. If a company and its personnel are motivated and committed to safety, detailed regulations are not necessarily needed.

Many of the comments dealt with safety policies on a general level. According to these comments, the content and the implementation of the current regulations should be developed instead of preparing new regulations. The respondents considered that, for the most part, the current regulations already include and regulate all necessary issues. Maritime safety cannot be ensured by increasing the amount of regulation, by increasing control and inspections or by creating specific certificates for every purpose. Instead, the respondents considered that the most important issues from the viewpoint of safety are competence, attitudes and motivation of the maritime personnel and all other actors of the maritime sector. The importance of practical experience and best practices should be emphasised. The management of the shipping companies and other actors of the shipping industry and supply chain (e.g. shippers) should take more responsibility for safety instead of delegating the responsibility to the maritime personnel.

4.1 *Comparison of the effectiveness of maritime safety policies and practices*

Most of the results of this study indicate that almost all of the current policies and practices have been effective and they have relatively high future potential. The majority of policies and practices got high scores of mean values of past effectiveness and future potential (over 3 or very near to 3). In addition, the distributions of the answers showed that a majority of the respondents strongly support the current variety of the policies. All other policies besides fairway and port dues, marine insurance and P&I Clubs were agreed on by over 50% of the respondents. Many policies got near or over 80% support from the respondents. Moreover, future potential was considered higher than past effectiveness in almost all policies. A majority of the respondents agreed strongly or partly with the fact that the policies and practices have the potential to improve safety in the future. The percentages in agreeing answers were over 50% on all except the questions concerning fairway and port dues, marine insurance and P&I Clubs.

Voluntary activity of companies had the highest mean (3.6) in the question about future potential and also a high mean (3.5) in past effectiveness. In addition, voluntary improvement got strong support in freely worded comments, and it was considered the most effective way to improve safety. If a company and its personnel are motivated and committed to safety, detailed regulations are not necessarily needed. In other words, self-regulation seems to be the most effective way to improve maritime safety in the future.

Nautical charts, fairway maintenance, information about navigation conditions, ship construction and traffic separation schemes all had very high past effectiveness, and they also had high future potential, although future potential was slightly lower than past effectiveness. These issues can be considered the cornerstones of maritime safety – without proper ships, maps, waterways and without proper information on what kind of circumstances can be expected during the voyage, safe navigation is not possible. The public maritime safety regime must take care that these issues are also handled properly in the future, although it cannot be expected that the development of these issues would contribute greatly to the improvement of maritime safety from the current level.

Pilotage, manning, competence requirements and employment and working conditions of seafarers have a mean of under 3 in the question about past effectiveness, but in the question about future potential means are clearly above 3. These are issues that seem to have major development potential compared to the current situation. Manning, competencies and working conditions are all very closely connected to human factor issues, which underlines the fact that the current maritime safety policy has not been able to deal effectively with these questions.

Although policies such as competence of seafarers and manning of ships and working and employment conditions of seafarers are based on public jurisdiction (notably STCW), these policies also have self-regulatory dimensions. The high scores of future potential and the freely worded comments indicate that the shipping companies should comply with the rules more carefully and that the shipping companies have many possibilities to enhance safety by making longer contracts and paying more attention to working conditions. Ships with competent and committed seafarers onboard are likely to be safer ships.

Besides economic incentives, all economic instruments (marine insurance, P&I Clubs, fairway and port dues) had a mean of under 3 in both questions. There can be various reasons for this. The respondents can sincerely be of the opinion that maritime safety cannot be improved with economic instruments. However, it can also be due to the reason that economic instruments have not been widely used to promote maritime safety, and that many

respondents might not have much personal experience for instance of P&I clubs. This conclusion is supported by the high number of 'no opinion' answers, especially in the questions about economic instruments. The number of freely worded comments was also low in these questions.

5 CONCLUSIONS

There has been a remarkable increase in maritime transportation and the transportation of oil in particular, in the Baltic Sea in the 2000´s. Over the last ten years, the volume of oil and oil products transported has tripled in this area. The shallow and rocky waters, narrow channels and severe ice conditions add to the risks of navigation in the Baltic Sea and, more particularly, in the Gulf of Finland. The relatively small sea areas, crossing traffic between Helsinki and Tallinn and oil tankers going to the west from the eastern part of the Gulf of Finland are a combination which can cause a disaster both for humans and environment. The focus in this paper has been on how to prevent an oil accident in the Gulf of Finland. The paper presents the findings of a questionnaire study that was targeted at Finnish maritime experts.

Several authors have raised strong criticism against the prevalent maritime safety regime due to various reasons. Due to the prevalent command-and-control policy, the following problems weaken the effectiveness of maritime safety policy:

1 Problem of regulatory overload – the shipping industry is bothered with excessive rules and inspections.
2 Maritime safety regulation can mostly be considered reactive – the 'post-accident' policy means that new rules and regulations have been established after major sea accidents, and preventive actions are still uncommon.
3 Maritime safety regulation concentrates on technical safety and has not been able to effectively address the problems of safety culture and human factor.
4 The implementation of maritime safety regulation varies too much between the flag states.
5 IMO is not able to offer quick solutions to maritime safety risks due to the characteristics of the IMO workings.

A questionnaire study among Finnish maritime experts was carried out to find out how maritime experts viewed the effectiveness of different preventative maritime safety policy instruments and how they thought maritime safety, with the focus on the Gulf of Finland, could most effectively be improved. The questionnaire results confirmed the findings of the literature review; however support for self-regulatory activities was surprisingly strong among Finnish maritime experts, both in the comparison of different policies and in the free-text comments.

The results indicate that the focus of future development in the studied area should be on self-regulative approaches and human factors issues. The proper competence, employment and working conditions of maritime personnel are vital for safe navigation. The implementation of these policies should be strengthened in order to ensure that seafarers are motivated and committed and that the working hour regulations are followed and developed in order to decrease fatigue.

In the future the focus should be placed on the development of existing regulations and practices, not on augmenting the amount of maritime safety regulation. It has to be taken care of that the cornerstones of maritime safety are handled properly - without proper ships, maps, waterways and without proper information on what kind of circumstances can be expected during the voyage, safe navigation is not possible.

However, it seems that new approaches are needed to tackle the problems in the governance of maritime safety, e.g. considering the implementation problems or human factor issues. This study indicates that self-regulatory approaches are needed in developing maritime safety in the Baltic Sea. In environmental governance of maritime activities (van Leeuwen and van Tatenhove, 2010) the shift from command and control policies to more self-regulatory approaches has been more obvious than in safety issues, but the conclusion is that the development of maritime safety governance could benefit from similar approaches. This is supported by the respondents' strong agreement with the importance of voluntary activities of companies. Effective self-regulation has many advantages compared to governmental regulation. For instance, it has more situational sensitiveness, it can adapt to changes more quickly and it decreases public expenditures. However, self-regulative approaches in the promotion of maritime safety are a subject that needs further analysis.

ACKNOWLEDGEMENTS

This article has been written as a part of the SAFGOF and CAFE research projects. We express our gratitude to the financers of the projects: the European Union, the Regional Council of Kymenlaakso, the Regional Council for Päijät-Häme, the City of Kotka, the Kotka-Hamina Regional Development Company Cursor, the Kotka Maritime Research Centre and the member companies of the Kotka Maritime Research Centre corporate group.

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