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# VIEWS OF FINNISH MARITIME EXPERTS ON THE EFFECTIVENESS OF MARITIME SAFETY POLICY INSTRUMENTS

Jenni Kuronen & Ulla Tapaninen



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## FOREWORD

The increasing shipping activity in the Gulf of Finland has given rise to concerns about the safety of maritime traffic, and more specifically about the possibility of a major oil accident due to the increasing oil export activities of Russia in the area. Various international, supra-national, regional and national policy instruments aim at minimizing the risks of accidents and other harmful effects of shipping.

This report discusses various maritime safety policy instruments. It includes the results of a questionnaire study that was targeted to Finnish maritime experts. The purpose of this questionnaire study was to find out what kind of maritime safety policy instruments are the most effective in the maritime experts' opinion, what they feel should be done to prevent an oil accident in the Gulf of Finland and what they think are the most important risks to maritime safety in the Gulf of Finland. The conclusions of the questionnaire study are compared to a literature study on the effectiveness of maritime safety policy instruments produced earlier (see Kuronen & Tapaninen 2009).

This report was written as a part of the research project “SAFGOF – Evaluation of traffic increase in the Gulf of Finland 2007-2015 and the effect of the increase on the environment and traffic chain activities” of Kotka Maritime Research Centre, and it is the result of Work Package 6 “Political and social instruments, guidelines and economic incentives”. The research was carried out by the Centre for Maritime Studies of the University of Turku. The research project is financed by the European Union – European Regional Development Fund – Regional Council of Kymenlaakso, the City of Kotka, Kotka-Hamina regional development company Cursor Ltd., Kotka Maritime Research Association Merikotka and the following companies of Merikotka corporate group: Port of Hamina, Port of Kotka and Arctia Shipping Ltd. (formerly Finstaship).

The Centre for Maritime Studies of the University of Turku expresses its gratitude to all those who took part in the questionnaire study, and to other parties who have contributed to the drawing up of this report.

Turku 27<sup>th</sup> September, 2010

Ulla Tapaninen  
Professor  
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## ABSTRACT

Various kinds of policy instruments are in use to reduce the number of accidents at sea and other harmful effects of shipping. Extensive maritime safety regulation is in place, ranging from international level (e.g. International Maritime Organization) to supra-national (European Union), regional (HELCOM) and national level. In the Gulf of Finland, the increasing amount of traffic and the large share of oil in maritime transports have given rise to extensive concern about the possibility of a major oil accident. Several measures have been adopted, and new measures are continuously being developed and proposed to prevent an oil accident. 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 the accident risks. It is thus important to establish what the causes for safety risks are and what measures to decrease the risks are the most effective.

This report presents the results of a questionnaire study about maritime safety policy instruments. The questionnaire targeted Finnish maritime experts and its purpose was to find out what the experts think about the effectiveness of different maritime safety policy instruments, how they think an oil accident in the Gulf of Finland could be prevented and what they feel are the most important risk factors. The research was conducted as part of the research project “SAFGOF - Evaluation of the Traffic Increase in the Gulf of Finland during the Years 2007-2015 and the Effect of the Increase on the Environment and Traffic Chain Activities” and the Work Package 6 of the project: “Political and social instruments, guidelines and economic incentives”.

On the basis of questionnaire responses, maritime safety policy instruments can be divided into several groups according to their effectiveness in the past and in the future. The largest potential to improve maritime safety level is found not in legislative measures, but in spontaneous activity of shipping companies. Regulations on competence, the working and employment conditions of seafarers, the manning of ships, piloting and fairway and port dues also offer good potential. Policy instruments which have been effective in the past and which still have future potential to improve maritime safety level include control of ship conditions, safety management system (ISM Code), VTS operations, traffic separation schemes and routing, economic incentives and information about safe shipping.

Issues that are crucial for safe shipping but have little development potential include regulation of ship construction and equipment, fairway safety, nautical charts and information about navigation conditions. In other words, the current situation is perceived to be comparatively satisfactory.

Marine insurance, P&I clubs or ship reporting system (GOFREP) did not seem to have much potential for the promotion of maritime safety according to the respondents. Issues which were relatively neutral in the respondents' view vetting inspections, escort towing and liability and culpability issues in oil accidents.

Overall, the primary focus should be on the human factor, if we wish to improve maritime safety. Technology, although important in itself, cannot make up for the human factor in safety matters. Spontaneous activity of shipping companies ranked as the most effective way to improve maritime safety in the future. The human factor related risks, such as fatigue, competence or safety culture, ranked as the highest risks for maritime safety in the Gulf of Finland. Human factor related measures were cited the third most often as ways to prevent an oil accident in the Gulf of Finland. The development of VTS operations came first, and the development of piloting came second.

Many types of maritime safety policy instruments are needed to ensure safe shipping. In the future, the focus should be on the development and implementation of existing instruments, not on augmenting the amount of maritime safety regulation. Instead of command-and-control policies, maritime safety regulation should increasingly develop towards supporting and encouraging shipping companies in responsible operation. Many maritime safety risks stem from economic pressures experienced by the shipping industry, and these cannot be efficiently solved with maritime safety regulation. More fundamental changes are needed in the global governance of the shipping industry to intervene in the underlying causes of safety risks.

## TIIVISTELMÄ

Merionnettomuuksia ja muita merenkulun haittavaikutuksia pyritään ehkäisemään erilaisilla yhteiskunnallisilla ohjauskeinoilla. Meriturvallisuutta koskevaa sääntelyä on runsaasti niin kansainvälisellä, alueellisella kuin kansallisellakin tasolla. Suomenlahden lisääntynyt meriliikenne ja öljykuljetusten suuri osuus liikenteestä on herättänyt laajaa huolta suuren öljyonnettomuuden mahdollisuudesta. Useita toimenpiteitä on otettu käyttöön öljyonnettomuuden ehkäisemiseksi ja uusia toimenpiteitä kehitetään ja ehdotetaan jatkuvasti. Vaikka tavoitteet ovatkin hyviä, vaarana on, että merenkulkualaa rasitetaan erilaisilla määräyksillä, toimenpiteillä ja kustannuksilla, jotka loppujen lopuksi pienentävät onnettomuusriskejä vain vähän. On siis tärkeää pyrkiä selvittämään, mistä merenkulun turvallisuusriskit johtuvat ja kuinka niihin tehokkaimmin pystyttäisiin vaikuttamaan.

Tässä raportissa on esitelty meriturvallisuuden ohjauskeinoja koskevan kyselyn tuloksia. Kysely tehtiin suomalaisille merenkulun asiantuntijoille ja sillä pyrittiin selvittämään, millaiset ohjauskeinot asiantuntijoiden mielestä ovat olleet tehokkaimpia meriturvallisuuden parantamisessa ja minkälaisissa ohjauskeinoissa he näkevät eniten kehityspotentiaalia tulevaisuudessa. Kyselyssä myös selvitettiin, miten öljyonnettomuus voitaisiin asiantuntijoiden mukaan tehokkaimmin ehkäistä Suomenlahdella ja mitkä ovat suurimmat riskitekijät Suomenlahden meriturvallisuuden kannalta. Tutkimus on tehty osana ”SAFGOF – Suomenlahden meriliikenteen kasvunäkymät 2007 – 2015 ja kasvun vaikutukset ympäristölle ja kuljetusketjujen toimintaan” projektia ja sen työpakettia 6 ”Keskeisimmät riskit ja yhteiskunnalliset vaikutuskeinot”.

Kyselytulosten perusteella meriturvallisuuden ohjauskeinot voidaan jakaa viiteen ryhmään. Alusten kunnan valvonta, turvallisuusjohtamisjärjestelmä (ISM-koodi), VTS-toiminta, väylien käytön ohjaaminen (esimerkiksi kaistajaot, reititys jne.), taloudelliset kannustimet, tiedotus turvallisesta merenkulusta ja yritysten oma aktiivisuus ovat asioita, joilla on ollut merkittävä rooli meriturvallisuuden edistämässä ja joissa nähtiin edelleen myös paljon kehityspotentiaalia. Ohjauskeinoja, jotka eivät ole vastaajien mielestä olleet toistaiseksi kovin menestyksekkäitä, mutta joilla voitaisiin tulevaisuudessa parantaa meriturvallisuutta merkittävästi, olivat etenkin merimiesten pätevyys, työehtoihin ja -olosuhteisiin ja alusten miehitykseen liittyvä sääntely, luotsaus sekä satama- ja väylämaksut.

Ohjauskeinoja, jotka ovat erittäin tärkeitä meriturvallisuudelle, mutta joissa ei välttämättä ole enää suurta kehityspotentiaalia tulevaisuudessa, olivat alusten rakenteet ja varusteet, väyläturvallisuus, merikartat ja olosuhdetietojen tarjonta merenkulkijoille. Näiden osalta kehittämiskohteina nähtiin lähinnä reaaliaikaisen tiedon välityksen kehittäminen esimerkiksi AIS-tiedonvälityksen avulla ja eri elektronisten laitteiden sisältämän tiedon synkronointi.

Vetting-tarkastukset, saattohinaus, vastuullisuus ja syyllisyyskysymykset öljypäästön tapahtuessa, olivat asioita, joihin vastaajat suhtautuivat muihin kysymyksiin verrattuna

neutraalisti: ne ovat olleet ja tulevat olemaan kohtuullisen tärkeitä meriturvallisuuden kehittämisessä, mutta ne eivät nousseet kuitenkaan tärkeimpien kehittämiskohteiden joukkoon.

Merivakuutuksilla tai P&I klubeilla ei ollut vastausten perusteella suurta merkitystä meriturvallisuuden edistämiseksi eikä niissä nähty myöskään merkittävää kehityspotentiaalia tulevaisuudessa. Myös Suomenlahden alusilmoittautumisjärjestelmä eli GOFREP sijoittui vastausten perusteella samaan ryhmään. GOFREP-järjestelmää moitittiin erityisesti siitä, että se lisää työtä aluksella, mutta nykyisellään alukset eivät näytä saavan siitä juuri mitään vastineeksi.

Kaiken kaikkiaan inhimilliseen tekijään pureutuvat keinot ovat kyselyn perusteella ensisijaisia, kun meriturvallisuutta pyritään parantamaan. Teknologian kehittäminen on tärkeää, mutta se ei voi korvata ihmisen vaikutusta turvallisuuteen. Yritysten oma aktiivisuus oli vastausten perusteella tehokkain tapa kehittää meriturvallisuutta tulevaisuudessa. Inhimilliseen tekijään liittyvät riskit, kuten merimiesten väsymys, pätevyys ja sitoutuneisuus tai varustamoiden turvallisuuskulttuuri nähtiin merkittävimpinä riskeinä Suomenlahden meriturvallisuudelle. Inhimilliseen tekijään liittyvät toimenpiteet saivat kolmanneksi eniten mainintoja tehokkaimpana tapana estää öljyonnettomuus Suomenlahdella.

VTS-toiminta ja luotsaus olivat aiheita, jotka herättivät paljon mielipiteitä. Ne saivat myös eniten mainintoja keinoina, joilla öljyonnettomuus voitaisiin estää Suomenlahdella. Monet vastaajat olivat sitä mieltä, että VTS-operaattoreiden pitäisi pystyä ohjaamaan enemmän alusten kulkua. Luotsauksessa mielipiteitä herättivät luotsauksen yhtiöittäminen, jolloin kaupallisen ajattelun katsottiin menneen turvallisuuden edelle, ja englanninkielisen linjaluotsauksen mahdollinen salliminen, jota osa vastaajista kannatti ja osa vastusti.

Merenkulussa suoritettavia useita alustarkastuksia (esimerkiksi lippuvaltio-, satamavaltio- ja vetting-tarkastukset) käsiteltiin useammassa kysymyksessä. Vastaajien mielestä erilaiset tarkastukset ovat usein päällekkäisiä ja tarkastukset pitäisi kohdentaa paremmin riskialuksiin. Tarkastuksissa keskitytään liiaksi dokumenttien tarkastukseen ja teknisiin yksityiskohtiin sen sijaan, että katsottaisiin aluksen todellista kuntoa ja operointia kokonaisvaltaisesti turvallisuuden näkökulmasta. Erilaiset tarkastukset vievät etenkin päällystön työaika ja lisäävät varustamoiden kustannuksia. Sen vuoksi eri tarkastusten ja toimijoiden välillä tulisi olla enemmän yhteistyötä, jotta tarkastuksien päällekkäisyyksiä voitaisiin karsia. Päällekkäisiä katsastusjärjestelmiä voidaan pitää merkinä kansainvälisen meriturvallisuuslainsäädännön toimeenpanon epäonnistumisesta.

Yhteenvetona voidaan todeta, että monenlaisia ohjauskeinoja tarvitaan turvallisen merenkulun edistämiseksi. Yleisesti ottaen vastaajat katsoivat, että suurin osa meriturvallisuussäätelystä tai muista ohjauskeinoista on parantanut meriturvallisuutta. Tulevaisuuden kehityksen osalta tulokset osoittavat, että sääntelyn tai ohjauskeinojen lisäämisen sijasta tulisi keskittyä olemassa olevien kehittämiseen ja että tehokkain tapa parantaa meriturvallisuutta tulevaisuudessa on yritysten oma toiminta ja aktiivisuus.

Mikäli yritys toimii vastuullisesti ja henkilöstö on motivoitunutta ja pätevää, yksityiskohtaista ja alati lisääntyvää meriturvallisuussäätelyä ei tarvita turvallisen merenkulun takaamiseksi. Useat vastaajat toivoivat, että meriturvallisuuden viranomaistyöskentely kehittyisi tulevaisuudessa ohjaavampaan ja kannustavampaan suuntaan lainsäädännön minimivaatimusten valvonnan sijaan. Lisäksi vastuu merenkulun turvallisuudesta kuuluu osaltaan myös muille merenkulkualan ja kuljetusketjujen toimijoille, kuten rahdinantajille, luokituslaitoksille tai merivakuutusenantajille. Turvallisuuden kannalta olisi hyvä, jos eri osapuolet toimisivat avoimemmin, jolloin tieto hyvistä käytännöistä tai havaituista riskeistä leviäisi paremmin merenkulkualalla.

Useimmat meriturvallisuusriskit juontavat juurensa alan kovaan taloudelliseen kilpailuun, minkä osaltaan mahdollistaa mm. mukavuuslippujen olemassaolo. Taloudellisten paineiden seurauksena aikataulut ovat tiukkoja ja aluksia operoidaan miehistön minimimäärällä, mikä johtaa miehistön väsymiseen. Turvallisuusriskejä, jotka pohjimmiltaan aiheutuvat alan taloudellisista paineista, ei voida tehokkaasti ratkaista meriturvallisuussäätelyllä, vaan tarvittaisiin koko merenkulun säätelyjärjestelmän uudistamista niin, että esimerkiksi turvallisuudesta piittaamattomien varustamoiden toiminta ei olisi mahdollista ja että vastuutahot olisivat onnettomuuksien sattua yksiselitteisesti todennettavissa. Kansainvälisen merenkulkujärjestön (IMO) lainsäädäntöprosessien tulisi olla sellaisia, että havaittuihin meriturvallisuusongelmiin pystyttäisiin puuttamaan tehokkaasti ja nopeasti.

Merenkulun turvallisuus tulevaisuudessa vaatii, että alalla on päteviä ja motivoituneita työntekijöitä. Merenkulkualan koulutuksen pitäisi olla laadukasta ja merenkulkuammattien kiinnostavia nuorille. On myös tärkeää, että merenkulkijoille järjestetään jatkokoulutusta esimerkiksi uusien teknologioiden käyttöön, sekä jatkokoulutusta, joka pätevoittää merenkulkijoita muihin merenkulkualan työtehtäviin, alan viranomaistehtäviin tai varustamoiden maatehtäviin. On myös pidettävä huolta siitä, että maihin sijoittuvat merenkulkualan tehtävät ovat esimerkiksi työtehtävien ja palkan puolesta houkuttelevia vaihtoehtoja kokeneille merenkulkijoille. Luottamus merenkulkualan eri osapuolten välillä on tärkeää turvallisen merenkulun takaamiseksi. Luottamuksen kehittäminen ja ylläpito vaatii sitä, että henkilöstö kaikissa tehtävissä on hyvin perillä käytännön merenkulusta ja arvostaa toinen toistensa osaamista.

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## **1 INTRODUCTION**

### **1.1 Background of the study**

The risk of a large oil accident in the maritime traffic of the Gulf of Finland and the Baltic Sea has given rise to extensive concern in society. Many efforts by several actors have been made to prevent an oil accident or to decrease its harmful consequences. New policies are also being planned and proposed continuously. International actors, such as the EU or HELCOM, states, NGO's, researchers and companies in the sector all seem to share this concern. The amount of maritime safety regulation is already extensive, ranging from safety of humans, ships, cargo and environment to security issues, and from the international level (International Maritime Organization IMO) to the supra-national (e.g. the European Union) regional (HELCOM) and national level.

Although the goals of all maritime safety efforts are good, there remains a risk of the shipping industry being encumbered with excessive rules and extra costs, which in the end will do little to improve maritime safety. Limited resources should be deployed to a maximum effect.

The previous report of Jenni Kuronen and Ulla Tapaninen (2009) "Maritime safety in the Gulf of Finland – Review on policy instruments" included a review and a literature analysis of different maritime safety policy instruments and their effectiveness. This report presents an empirical further study on the same theme, including the results of a questionnaire study for the maritime experts in Finland.

The study was conducted as part of the EU-funded research project "SAFGOF – Evaluation of the Traffic Increase in the Gulf of Finland during the Years 2007-2015 and the Effect of the Increase on the Environment and Traffic Chain Activities" of the Kotka Maritime Research Centre" (KMRC), and the Work Package 6 of the project "Political and social instruments, guidelines and economic incentives".

Work Package 6 of the SAFGOF project is carried out by the Centre for Maritime Studies of the University of Turku, which has previously completed two Work Packages in the SAFGOF project: WP 1 "Baltic Sea traffic flows" (Kuronen et al. 2008) and WP 4 "Atmospheric emissions of the increasing maritime traffic" (Kalli & Tapaninen 2008). The above-mentioned report "Maritime safety in the Gulf of Finland – Review on policy instruments" (Kuronen & Tapaninen 2009) was published in the above-mentioned Work Package 6. The SAFGOF project began on the 1<sup>st</sup> of January 2008, and it will end on the 31<sup>st</sup> of December 2010. The project is financed by the European Union – the European Regional Development Fund – the Regional Council of Kymenlaakso, the City of Kotka, Kotka-Hamina regional development company Cursor Ltd., Kotka Maritime Research Association Merikotka and the following members of the Kotka Maritime Research Centre Corporate Group: Port of Hamina, Port of Kotka and Arctia Shipping Ltd. (formerly Finstaship). This report was written by researcher Jenni Kuronen with the support of Professor Ulla Tapaninen.

## **1.2 Contents and structure of the report**

This report includes the results of a questionnaire study that was targeted at the Finnish maritime experts including seafarers, pilots, maritime authorities, representatives of maritime education, classification societies, marine insurers, the Coast Guard, sea rescue and related organizations. In the questionnaire study, the maritime experts in Finland were asked about their views of the effectiveness of different preventative maritime safety policy instruments in the past and in the future. The questionnaire also included questions about the risk factors of maritime safety in the Gulf of Finland and the most effective ways to prevent an oil accident in the Gulf of Finland. The purpose of the survey was to find out how the 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.

Maritime safety includes the safety of people both on board and ashore, the safety of cargo transportation, the safety of the environment (operational or accidental discharges from shipping) and security issues (terrorism and other intentional malicious damage). In this report, the main focus is on the safety of shipping from the point of view of accidents at sea and their prevention. In other words, such issues as operational discharges from shipping or security threats are excluded from this report.

The focus in the questionnaire was on preventative instruments and on the Gulf of Finland or other sea areas near Finland. The geographical limitation was adopted for several reasons: the focus of the research project is the Gulf of Finland (GoF), the whole world would have been too broad (maritime safety situation e.g. in the Gulf of Aden must be very different from that in the GoF), and it was assumed that most of the respondents were the most familiar with shipping in the sea areas surrounding Finland, or the Baltic Sea.

The report is structured as follows. Firstly in the Chapter 2, practical information about the questionnaire survey is presented: the implementation and structure of the questionnaire, the processing and analysis of results, and the number and background of respondents.

Responses to the questionnaire are analysed in Chapters 3 and 4. They are dealt with in the same order as the questions in the original questionnaire, except for question number 28 about ship inspections, which is discussed together with the other two questions on ship inspections (questions 6 and 7, Chapters 3.2-3.4).

Chapter 3 includes the results of the first part of the questionnaire, which dealt with the effectiveness of different kinds of maritime safety policy instruments from regulatory instruments (regulations on ship structure and equipment, supervision of ship conditions, regulations on seafarer related issues and regulations on navigation), to economic instruments (fairway and port dues, marine insurance, liability issues etc.),

and to information guidance and to spontaneous activity of shipping companies. Before the analyses of responses to each question, a short presentation of the regulations/practices in question is given. A more detailed introduction to each issue can be found in Kuronen & Tapaninen 2009.

Chapter 4 discusses the results of the second part of the questionnaire, which included questions about the prevention of an oil accident in the Gulf of Finland and about risk factors of maritime safety in the Gulf of Finland.

Chapter 5 makes a connection between an earlier literature study (Kuronen & Tapaninen 2009) and the questionnaire study results. It includes a short summary of the main results in Kuronen & Tapaninen (2009) and looks at them in the light of the questionnaire study results.

Chapter 6 includes the conclusions of the study.

The purpose of this report is to analyse the effectiveness of maritime safety policy instruments at a general and theoretical level. All topical issues of maritime safety policy have mainly been excluded from this report, and neither does this report present current changes or development work of maritime safety policy regulation or maritime safety policy. The purpose of this exclusion is to avoid the information presented in this report soon becoming outdated, as maritime safety policy is constantly under development.

## **2 QUESTIONNAIRE STUDY**

### **2.1 Implementation of the questionnaire study**

The questionnaire study was carried out in Finnish using the web based system “Webropol” (<http://w3.webropol.com/>) in February – March 2010. The questionnaire was offered in two ways: as an open questionnaire on the Internet and as an e-mail questionnaire to selected respondents. The two questionnaires were the same, except that the open questionnaire contained a few more questions about the background of the respondents.

When the questionnaire was formulated, an effort was made to keep it as short and clear as possible to make it as easy to fill in as possible. This also meant that the questions could not be very elaborate, which may have distorted the issues dealt with in the questionnaire. For instance, regulation on ship structure and equipment is extensive and detailed and its impacts are very different from such as liability questions in oil damages, but for the sake of simplicity these issues were dealt with in the same way in the questionnaire.

The responses of two maritime experts who tested and commented on the questionnaire before its implementation were included in the final results, since no major changes were made to the questionnaire on the basis of the pilot study.

#### **2.1.1 Open questionnaire**

The open questionnaire was published on the website of Kotka Maritime Research Centre ([www.merikotka.fi](http://www.merikotka.fi)). Information about the questionnaire was sent to the following Finnish trade unions: Suomen Laivanpäälystöliitto (ship officers), Suomen Merimies-Unioni (seamen), Suomen Konepäälystöliitto (engine officers) and Suomen luotsiliitto (pilots), and these were asked to spread the word about the questionnaire to their members.

The participants in conferences and training courses of the Centre for Maritime Studies were encouraged to take part in the study while the questionnaire was on the Internet (3.2.-22.3.2010). Information about the questionnaire was also disseminated in private meetings with Finnish shipping companies.

#### **2.1.2 E-mail questionnaire**

The respondents of the e-mail questionnaire received a personal link to the questionnaire by e-mail. The potential respondents represented the following groups: maritime authorities including VTS personnel (40 persons), pilots (6 persons), seafarers

(24 persons), shore-based employees in Finnish shipping companies (17 persons), maritime education (21 persons), students of the Certificate in International Shipping and Commerce (CISC) supplementary course of the Centre for Maritime Studies (42 persons) and others (25 persons) including e.g. interest groups, other authorities, classification societies, marine insurers and sea rescue personnel. The total number of potential respondents who received an e-mail was 175 persons. E-mail addresses were obtained from the Internet, from the customer register of the Centre for Maritime Studies or through personal contacts. CISC students were included because it was presumed that many of them work on vessels or in the shipping industry.

In the e-mail message, the potential respondents were also informed about the open questionnaire on the Internet and encouraged to spread the word about the study. Some of the e-mail respondents responded to the open questionnaire on the Internet instead of the e-mail link.

## **2.2 The structure of the questionnaire**

The complete questionnaire is included in Appendix 1 (in English) and Appendix 2 (in Finnish). The questionnaire can be divided into three sections. The first set of questions dealt with the background information of the respondents. The second part included the largest number of questions in which the respondents were asked about different kinds of safety regulations and practices in the shipping industry. They were asked to evaluate if they thought the existing regulations/practices had been effective in improving maritime safety, and secondly they were asked to evaluate if they thought that further development of regulations and practices could improve safety in future. 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”. The safety regulations and practices that the respondents were asked to evaluate ranged from regulatory instruments (ship structure, ship conditions, seafarer issues, safety management, navigation related issues, culpability issues in oil damages) to economic instruments (fairway and port dues, marine insurances, P&I Clubs, financial liability issues related to oil damages, economic incentives) and to information guidance and spontaneous activity of companies. In all issues, the respondents were also given an opportunity to write freely worded comments.

The third part of the questionnaire contained two specific multiple choice questions about the prevention of an oil accident in the Gulf of Finland and the effectiveness of different kinds of inspections. The third part also included a question in which the respondents were asked to evaluate the significance of certain risk factors from the point of view of maritime safety in the Gulf of Finland or the neighbouring water areas of Finland. In this question the respondents had five options: “not significant at all”, “significant to a small extent”, “quite significant”, “very significant”, and “no opinion”.

All questions were obligatory and a respondent could not move on in the web questionnaire without answering (excluding free comments, which were voluntary in all cases).

## **2.3 Analysis of responses**

### **2.3.1 Multiple choice questions**

The responses were processed in Microsoft Excel. The absolute number of responses and their relative frequencies in each option were calculated. In the report, all of the results are analyzed together, and the different respondent groups are not kept separate. In some of the questions, 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 because the number of representatives in each respondent group was quite small, the differences in response distributions between different respondent groups was in many cases either one or two respondents only. For these reasons, it was concluded that a comparison between different respondent groups was not rational, and it was not included in the report.

The distributions of responses to each question were brought together and the results were analysed in the form of tables and figures.

### **2.3.2 Open-ended questions**

The amount of freely worded comments ranged from 3 to 28. In the majority of questions, the number of comments varied between 10 and 20. The smallest number of comments (3) was given on P&I clubs and the largest number of comments (28) on VTS. Over 20 comments were also made on competence of seafarers and manning of ships (26 comments), public control of ship conditions (24 comments), piloting (23 comments), ship construction and equipment (22 comments) and the ISM Code (20 comments). In other words, these issues elicited the greatest number of freely worded opinions. The questions about economic instruments (fairway and port dues, marine insurance, P&I clubs, economic incentives etc.) gave rise to fewer comments than the other questions.

Not all freely worded comments are necessarily included in this report, and comments that had similar content were amalgamated. Some comments were left out because their meaning was unclear. Therefore, the total number of freely worded comments does not equal the number of comments that have been cited and included in this report.

In general, freely worded comments tended in many questions to be quite critical of 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 criticize were probably more likely to write freely worded comments than others. Some respondents were more active in writing comments, but in general it was not the same respondents who contributed freely worded comments in every question.

## 2.4 Number and background of the respondents

A total of 96 persons filled in the questionnaire. 63 of these responded to the e-mail questionnaire and 33 to the Internet questionnaire. Of the e-mail respondent candidates, 36% responded to the e-mail questionnaire.

The respondents were divided into the following groups (in alphabetical order): maritime authorities, maritime education, shore-based employees of shipping companies, others (incl. e.g. representatives of classification societies, marine insurers, coastguard, sea rescue and NGO's), pilots and seafarers.

Table 2.1. Respondents according to their current occupation

<b>Group</b>	<b>Number of respondents</b>	<b>Percentage</b>
Maritime authorities	13	13.5
Maritime education	12	12.5
Shore-based employees of shipping companies	11	11
Others	19	20
Pilots	18	19
Seafarers	23	24
<b>Total</b>	<b>96</b>	<b>100</b>

The number of respondents who originally belonged to the group “CISC students” (see Chapter 2.1.2) was 8 persons, but those CISC students (5 persons) who answered in question 1 (see Annex 1) that they have seafaring experience were treated in the analysis as seafarers, and other CISC students (3 persons) were included in the group “others”.

The respondents quite evenly represented different respondent groups. 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 which 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%.

Regardless of their current position, most of the respondents had a 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 experience in working in the maritime sector of less than 10 years. It emerged that some of the respondents who had 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 maritime industry based on a long experience in the sector, and they therefore are the right persons to represent experts on the issue: 77% of respondents had a seafaring experience of over 5 years, and part of these had in addition working experience in other shipping related jobs.

**Seafaring experience of the respondents**

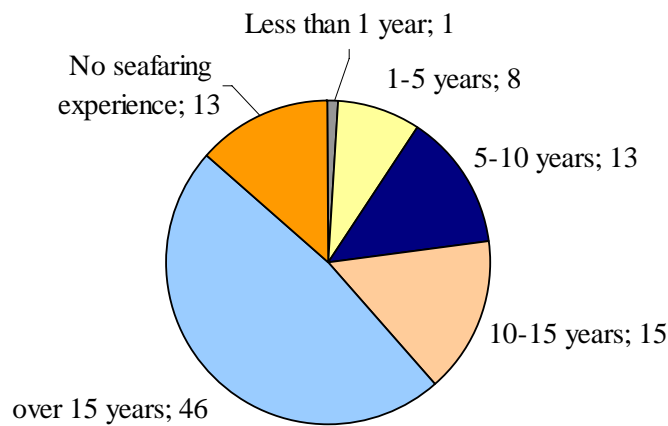


Figure 2.1. Seafaring experience of the respondents (number of respondents)

**Experience of other maritime industry related jobs**

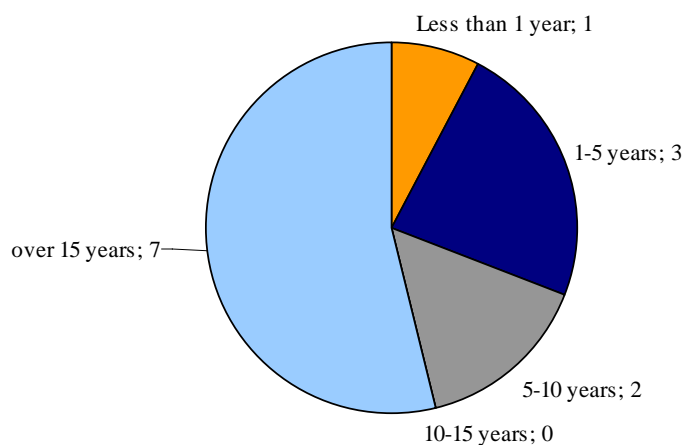


Figure 2.2. Experience of other maritime industry related jobs of respondents who did not have seafaring experience (number of respondents)

### 3 THE EFFECTIVENESS OF POLICY INSTRUMENTS IN THE PAST AND FUTURE

#### 3.1 Ship construction and equipment

The ship structure and equipment is most prominently regulated by the IMO and its Conventions, for example the SOLAS, MARPOL and Load Lines Conventions. Regulations on the ship structure and equipment cover such areas as construction and subdivision, stability, equipment, stowage and navigation devices. It appears that the IMO is developing its ship construction instruments towards a goal-based standard system. The premise behind the development of goal-based standards is that the IMO sets a standard that has to be achieved, leaving classification societies, ship designers and naval architects, marine engineers and ship builders the freedom to decide how to meet the required standards. (IMO 2009)

The majority of respondents were of the opinion that the existing regulation on ship construction and equipment has enhanced maritime safety remarkably: 51% agreed strongly and 43% partly. Very few respondents disagreed partly (3%), and none disagreed strongly. The majority of the respondents also felt that the development of regulation on ship construction and equipment has potential to enhance maritime safety in the future, although they were slightly more sceptical about the positive impact of future development compared to the effects of existing regulation: 33% agreed strongly and 53% partly. Some respondents also disagreed strongly with the argument concerning possibilities to improve regulation on ship structure and equipment, commenting that there should be no more regulation and that all the necessary issues have already been regulated.

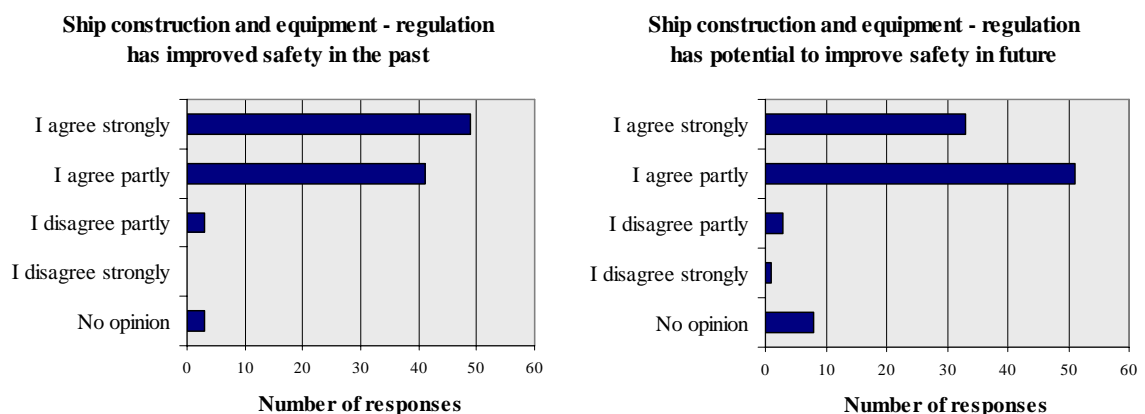


Figure 3.1. Ship structure and equipment – distribution of responses

Some concrete actions to improve ship structure and equipment were suggested in the freely worded comments.

- Ship structures should be strengthened (“more iron”) due to ice conditions and climate change, which will result in worse storms and other difficult weather conditions. (4 comments)
- Control, propulsion and navigation systems should be designed to be more reliable. Currently, one small defect can stop the functioning of the whole system. (2 comments)
- Bridge environment could be designed to be more user-friendly; for example to reduce fatigue, there could be some kind of fitness equipment on the bridge. (2 comments)
- Development of the AIS device and software system so that it would decrease the need for reporting and increase information sharing about safety related issues. (2 comments)
- SOLAS and other regulations are mainly based on opinions. More analytical methods (e.g. risk management, root cause analysis, FMEA) could bring forth more effective solutions. (2 comments)
- There should be a system that would automatically synchronize the settings of bridge devices – now changes in settings have to be made to each device separately. (1 comment)
- Regulation on lifeboats should be revised. Lifeboats should be constructed to give the crew easy and fast access to them, also in stormy weather. (1 comment)
- Proper training of personnel in the use of technical devices is important. (1 comment)
- More focus on how ships and equipment work in cold and icy conditions. (1 comment)

### **3.2 Public control of ship conditions**

Surveillance of ship conditions aims at checking that ships comply with the requirements. Public control of ship conditions includes inspections related to flag state control, port state control and host state control and control of classification societies to the extent that a public administration has authorized classification societies to perform public control of ship conditions.

The respondents felt that the effects of public control of ship conditions on maritime safety would be positive. 49% agreed partly and 31% strongly with the argument that public control has improved maritime safety. The respondents also felt that public control of ship conditions should be developed further: 45% agreed partly and 41% strongly.

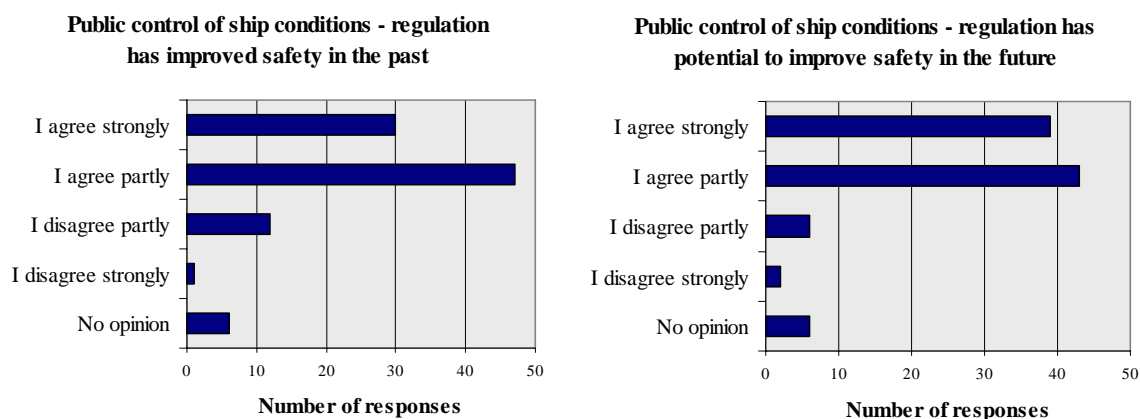


Figure 3.2. Public control of ship conditions – distribution of responses

The following comments were made on the public control of ship conditions.

- The standard of expertise of inspectors is not always what it should be. Inspectors should have strong personal experience of seafaring. All inspectors should have the same standards in their work, both in Finland and world wide. Now this is not the case. (8 comments)
- Different inspections overlap, and there should be some kind of co-operation between different inspections so that the same issues are not checked in every possible inspection, because inspections occupy resources. Inspections should be targeted better at risky vessels. (5 comments)
- Inspections focus on details and irrelevant issues. The inspectors do not want to intervene in difficult and complicated safety risks and focus instead on small details that are easy for them. Inspections also focus too much on just checking the documents instead of looking at the real conditions on a ship. (4 comments)
- The respondents brought up the following issues that should be examined more carefully in inspections: professional skills of crew, language skills of crew, monitoring of work and rest hours onboard and operation of small vessels. (4 comments)
- There should be more co-operation between pilots, the VTS and inspectors in order to share information e.g. about risky vessels. (1 comment)
- Inspectors should have possibilities to impose stricter sanctions if requirements are not fulfilled. (1 comment)

Responses to this question reflect the fact that inspections are considered necessary but there seem to be many issues in inspection practices that should be improved.

### 3.3 Vetting inspections

Vetting inspections are private ship inspections that are performed especially in the oil tanker sector, but to some extent also on chemical tankers and on bulk ships. Vetting inspections are required by e.g. oil majors who wish to ensure that the ships carrying their cargo are in proper condition.

As regards the question about vetting inspections, there was a relatively high number of “no opinion” answers, which probably reflected the fact that vetting inspections are mainly performed in the tanker sector, and many of the respondents probably did not have much experience about them. However, 39% agreed partly with the argument that vetting inspections have improved maritime safety. The same number agreed partly with the claim that vetting inspections also have potential to improve maritime safety in the future, but compared to other questions, the number of respondents who felt that vetting inspections will not have potential to improve maritime safety in the future was relatively high (1 % disagreed totally and 12 % partly).

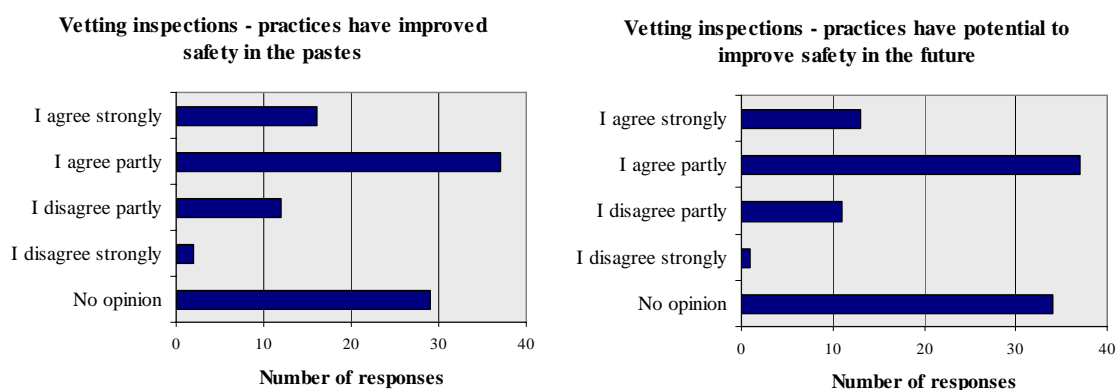


Figure 3.3. *Vetting inspections – distribution of responses*

Some positive comments were given about the vetting inspections: they have created the real requirement level of safety for the tanker sector and improved safety by focusing on important issues. The comments about vetting inspections were partly the same as in the question about public control of ship conditions: there are too many inspections, they are overlapping, the quality of inspections varies and they require too many resources. Some critical comments were also made about vetting inspections.

- Besides the tanker sector, vetting inspections are needed in other sectors of shipping as well, e.g. in dry bulk or ro-ro ships. Tankers are not the only risk in the seas, and the most dilapidated ships are nowadays found elsewhere. (3 comments)
- Oil companies, which require vetting inspections, want to get “results” from vetting inspections and so inspectors focus on details as they want to find deficiencies. At the same time, an overall view of the ship's conditions and seaworthiness is forgotten. (3 comments)
- Oil companies should have some kind of a register for vetting inspections in order to avoid a situation in which every oil company wants to carry out their own vetting inspections, adding to the workload of deck officers. (1 comment)

### **3.4 Separate question about ship inspections**

The questionnaire also included a separate question about ship inspection practices. The purpose of question 28 was to find out what maritime experts thought about the several inspection systems that are in use in the shipping industry. The respondents were asked if they think that all inspections that are performed in shipping industry are effective and if they are needed to ensure safety, or are there inspections that are unnecessary. A third option was that inspections could be effective but their contents and practices should be developed. Respondents were also asked to justify their opinion, but not all the respondents did that.

The majority of respondents (42%) were of the opinion that inspections could be effective, but their contents and practices should be developed. 31% of the respondents thought that all inspections are necessary and effective. 14.5% answered that not all the inspections are necessary. 12.5% had no opinion.

Those who responded that they think all inspections are not necessary elaborated their views as follows:

- Flag state controls are just formalities nowadays. (2 comments)
- Port state controls are not necessary. (2 comment)
- Vetting inspections system overlaps with other inspections. (1 comment)
- In vetting inspections, there should be a single actor carrying out the inspections, and oil companies should trust that. (1 comment)
- There should not be several inspections during one port call. (1 comment)
- ISPS<sup>1</sup> controls are not necessary. (1 comment)

Those who were of the opinion that inspections could be effective but their contents and practices should be developed brought up similar issues as in the previous question about inspections (see Chapters 3.2 and 3.3).

- Different inspections overlap. There are many actors who perform inspections, because nobody trusts inspections carried out by somebody else, and still you see ships that are in such a condition that it is difficult to believe that they fulfil all the requirements. Co-operation between different actors is needed in order to decrease the number of inspections. (9 comments)
- The quality of inspections varies too much from one country to another and from one classification society to another. At the moment, certain things are accepted in one country but not in another. (8 comments)
- Inspections should focus on relevant issues, not on small details, and they should also increasingly focus on encouragement than in looking for mistakes. Inspections also focus too much on checking documents. Management and shipping companies should also be monitored – now it is too easy just to “make up” ships to fulfil minimum requirements. (6 comment)
- The inadequate competence of inspectors is a problem in Finland. (4 comments)
- The level of know-how is not checked in any inspection. (1 comment)

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<sup>1</sup> ISPS – International Ship and Port Facilities Security Code

- There could be changing themes in inspections. (1 comment)
- Inspections should be targeted according to flag states. (1 comment)
- VTS, piloting and port state controls could be combined. (1 comment)
- Check lists for new inspectors. (1 comment)
- Inspections create “quasi-safety” and add to the workload. (1 comment)
- Maritime authorities should have more power to impose penalties, e.g. in the case of detentions or fines. (1 comment)

### 3.5 Competence requirements of seafarers and manning of ships

The IMO regulates the training of seafarers, the manning of ships and some other seafarer related issues in the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW). The regulation contains e.g. requirements on the number of crew members a ship must have and the kind of education and training required of them.

In the question about competence requirements of seafarers and manning of ships, a clear message came up: existing regulations have not been as effective as they should be (46% agreed partly and 23% disagreed partly) and that regulation should be developed further (42% agreed partly and 40% agreed strongly). In other words, 82% were of the opinion that development of competence requirements and manning of ships has potential to improve maritime safety, and none of the respondents disagreed strongly with that.

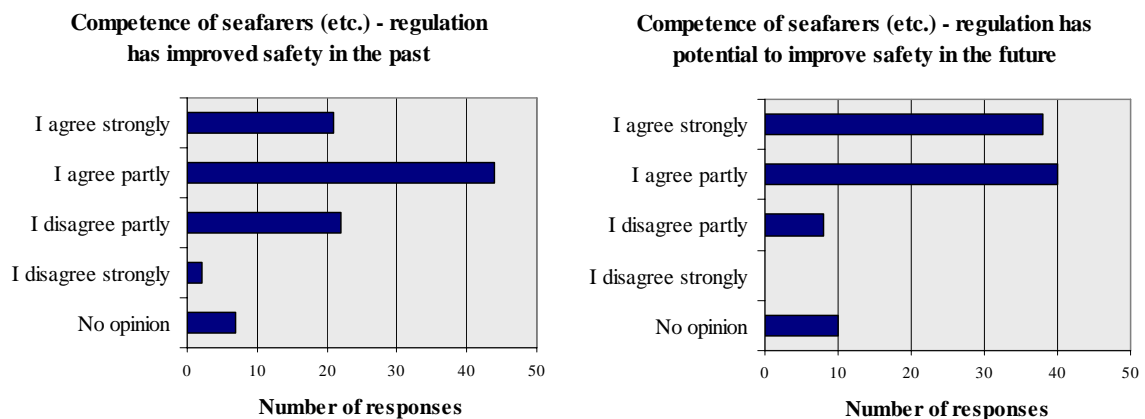


Figure 3.4. *Competence requirements of seafarers and manning of ships – distribution of responses*

Freely worded comments:

- Young seafarers should have more practical experience before they can work as deck officers. STCW-95 has decreased the level of maritime education in Finland (the amount of practice required has been decreased). Nowadays education is focused on the use of technical devices, and young seafarers rely too much on technology and do not know what to do if it fails. On the other

hand, older seafarers can have inadequate knowledge of technical devices and they should receive more training in their use. (10 comments)

- Minimum requirements for manning are too small, and too often ships are manned with the minimum level instead of looking at the real situation and need. Minimum manning can easily lead to a situation where resting periods are violated (e.g. by using emergency overwork) and the personnel suffers from fatigue. There should be stricter sanctions to shipping companies if regulations are not followed. (6 comments)
- Attention should be paid to communication issues. All crew members should have good skills in the working language. (3 comments)
- Competence requirements are too diverse between different flags. (3 comments)
- Manning rules should be drawn up separately for different types of traffic areas. (1 comment)
- More employees to the bridge (e.g. two navigating officers), especially in high risk areas. (1 comment)

### 3.6 Employment and working conditions of seafarers

The IMO regulates some working condition related issues in STCW Conventions and has also adopted resolutions and guidelines on working conditions, for example to reduce the fatigue of seafarers. Employment conditions are to a great extent regulated by national legislation, although the International Labor Organization has some activities in this area.

As in the previous question about competence requirements and manning, the results were roughly the same in the question about employment and working conditions of seafarers: existing regulation has not been as effective as it should be (only 5% agreed strongly, 53% agreed partly and 24% disagreed partly) and regulation should be developed further (48% agreed partly and 30% agreed strongly).

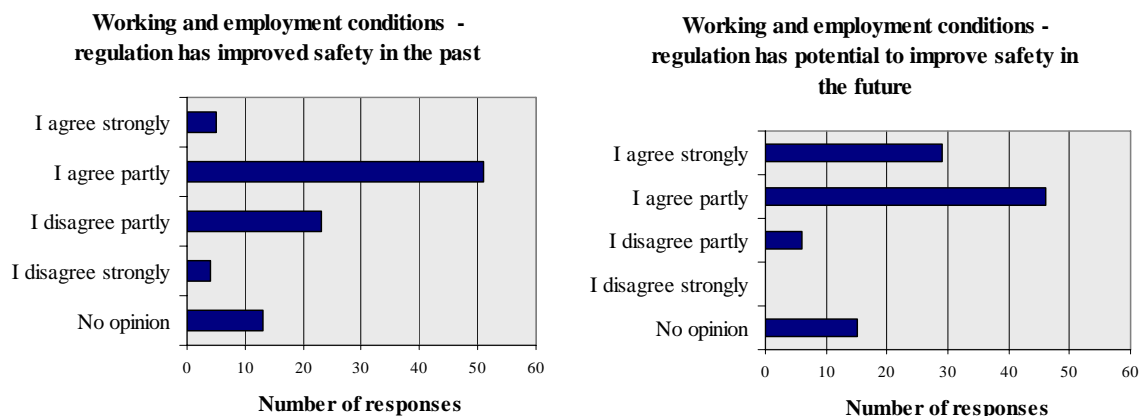


Figure 3.5. Employment and working conditions of seafarers – distribution of responses

The freely worded comments were also similar to those in the previous question. Fatigue of seafarers and the use of cheap labour were mentioned as major risks to maritime safety.

- Currently, shifts are too long, and resting hours are violated in many cases. Working time systems in ships should be developed, or at least the current legislation should be followed in order to give seafarers enough rest. When people are tired, they make many mistakes they would not otherwise make. (10 comments)
- Seafarers should have the same wage for the same job. The use of cheap labour and violation of terms of employment is a risk for maritime safety. (3 comments)
- Long contracts of employment are likely to improve safety as people are probably more committed to and motivated in their jobs than in short contracts. (1 comment)
- More attention should be paid to the wellbeing of the work community and to community spirit. (1 comment)

### 3.7 Safety management system – the ISM Code

The International Safety Management (ISM) Code requires a ship to have a safety management system. The ISM Code is included in the SOLAS Convention of the IMO. The ISM Code requires a company to establish and provide protocols for safe ship operation and a safe working environment. The company must also establish safeguards against all identified risks. The ISM Code also entails the idea of companies continuously improving safety.

The majority of respondents were positive about the effect of the ISM Code on maritime safety. 54% agreed partly and 21% agreed strongly with the argument that regulation on the ISM Code has improved maritime safety. 47% agreed partly and 31% agreed strongly with the claim that by developing the ISM Code, maritime safety could be improved.

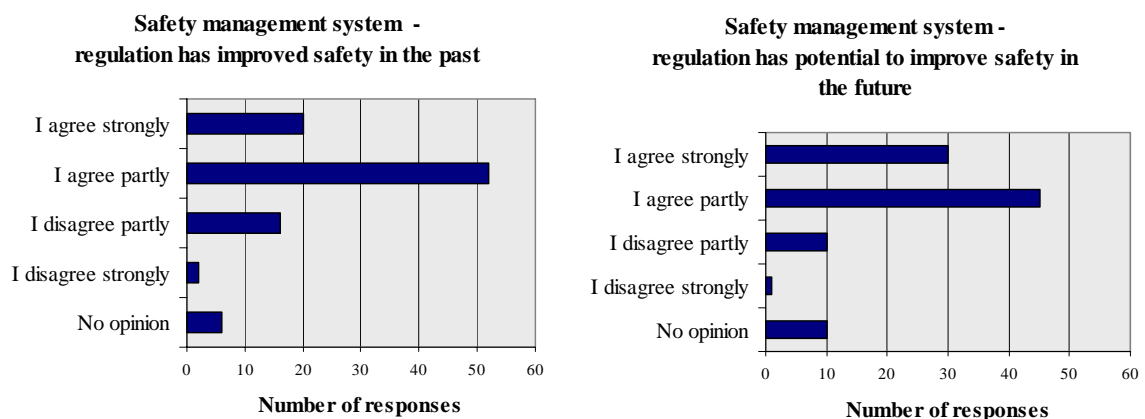


Figure 3.6. Safety management system (the ISM Code) – distribution of responses

Freely worded comments:

- Safety management systems are too detailed. Instead of detailed manuals, seamanship and common sense approach to safety should be developed. (5 comments)
- Safety management systems explain how things should be – the practice can be something totally different. This can for example be due to the fact that shipping companies may have seen the ISM Code as unavoidable and only fulfil the minimum requirements, or because there is no time to put safety management properly into practice. (4 comments)
- The ISM Code has added to paperwork but done little to improve safety. (4 comments)
- ISM audits should be developed. At the moment, the interpretation of requirements and the expertise of auditors are too diverse. Audits could also encourage shipping companies to set up good safety management systems instead of just checking if the safety management system fulfils the requirements. (2 comments)
- Safety management, environmental safety and occupational safety should be integrated. (1 comment)
- The ISM Code has clarified responsibilities. (1 comment)

### **3.8 Vessel Traffic Services – VTS**

In the Vessel Traffic Services (VTS) centres, the maritime traffic situation is monitored in real time based on information transmitted by the AIS (Automatic Identification System), radars, cameras and VHF radios. The VTS centres inform ships of the traffic situation, the conditions of fairways and safety devices and other issues concerning the safety of navigation in the area. The SOLAS Convention defines the circumstances in which the contracting states must maintain VTS services.

43% of the respondents agreed partly with the argument that VTS has improved maritime safety, but a relatively high share of the respondents, or 20%, disagreed either partly or strongly with the claim. However, respondents believed that VTS operations have potential to improve safety: 44% agreed partly and 31% strongly.

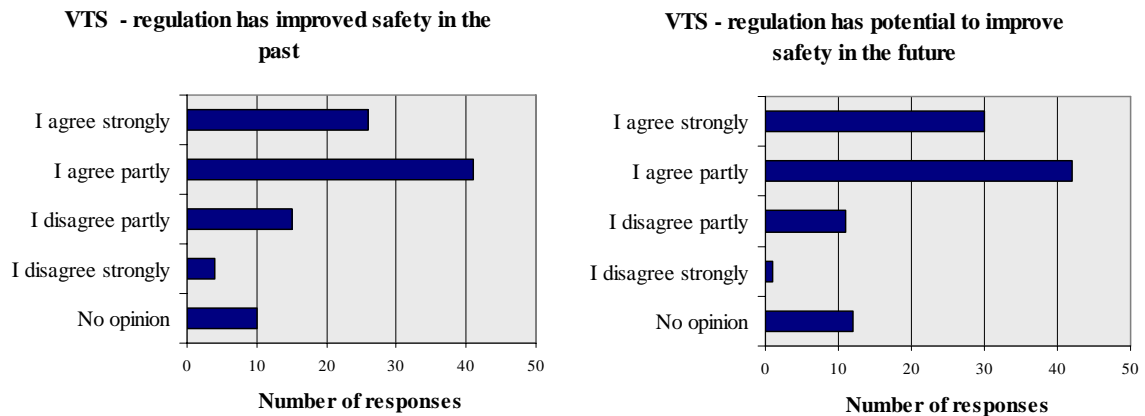


Figure 3.7. VTS – distribution of responses

This question inspired the largest number of freely worded comments, or 28.

- The VTS should be developed to be more like air traffic control, especially in sea areas with high risk levels. At the moment, the VTS mainly monitors ships instead of controlling them. In some countries, the VTS has a more active role in traffic control than in Finland. The VTS should interfere with potentially dangerous situations faster and there should be sanctions for violations. (12 comments)
- Co-operation both between different actors (VTS, ship officers, pilots, authorities etc.) and between technical devices (AIS, electronic charts etc.) should be developed to gain maximum benefits from the VTS. At the moment, the co-operation does not work in all issues, and information is not transmitted as effectively as it could. There could for example be shared meetings where different actors could get to know each other and share information. (8 comments)
- VTS operators should have more experience in seafaring. VTS work (duties, salary, working hours etc.) should be developed to ensure that VTS work attracts experienced seafarers. (5 comments)
- Automatic alarm systems e.g. when a ship is not on the fairway might help VTS centres to notice dangerous situations at an early stage and to intervene in them before something happens. (1 comment)
- VTS centres in different countries should harmonise their practices. (1 comment)
- Operator in a VTS centre can make the same mistakes as an officer on the bridge. In addition, a VTS operator is not at the mercy of the weather conditions and traffic situation at sea, which may affect his or her capacity of evaluating the situation. (1 comment)
- The VTS system should be extended to all parts of the Baltic Sea. (1 comment)

### 3.9 Ship reporting systems – GOFREP

In the international waters of the Gulf of Finland, Russia, Finland and Estonia have agreed on a Mandatory Ship Reporting System (GOFREP), which has IMO approval. When arriving in the GOFREP area, ships heading to the east report to the Tallinn VTS centre, and ships heading to the west to the Helsinki VTS centre. The GOFREP area is divided between the southern part of the GoF, which is supervised by Estonia, the northern part supervised by Finland, and the bottom of the GoF, which is monitored by Russia. If a ship is breaking the rules of the GOFREP system, the GOFREP authorities report this to the flag state, which can hold the master accountable.

In comparison with the other questions, the respondents were slightly more sceptical about whether ship reporting systems, in this case GOFREP, have increased safety. 5% of the respondents disagreed strongly and 22 partly, which are relatively high percentages when compared to other questions. However, the number of respondents who thought that ship reporting systems could improve safety if GOFREP practices were developed further was higher: 41% agreed partly and 19% agreed strongly.

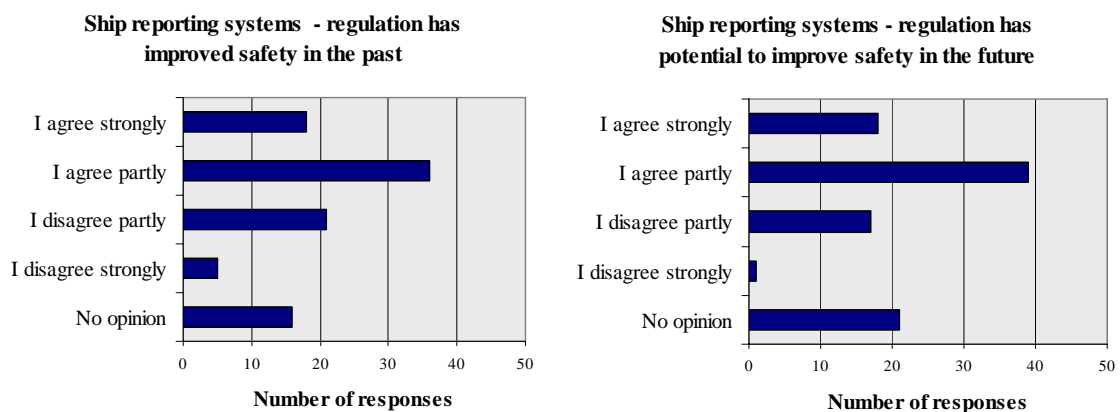


Figure 3.8. Ship reporting systems – distribution of responses

According to the freely worded comments, GOFREP adds to the workload on the bridge but has done little to improve safety. Some respondents even felt that GOFREP decreases safety because it adds to the information “to-do” on the bridge, and submitting GOFREP reports takes attention away from the real navigation, especially in challenging circumstances. For example, one respondent who regularly sails in the Gulf of Finland wrote that during the four years GOFREP regulation has been in force, a VTS operator has only once given some guidance about crossing traffic. In principle, ship reporting systems such as GOFREP could be effective, but information flows should be synchronized (e.g. in relation to AIS) and the practices of the VTS centres should be developed to ensure that ships could really get help for example in situation awareness. Currently a GOFREP report has to be submitted, but ships do not seem to get very much in response. There should also be severe enough sanctions for violations of the GOFREP system. What happens if the rules are violated currently depends too much on the interests and activity of the flag state. (10 comments)

### 3.10 Traffic separation schemes and routing

The purpose of traffic separation schemes is to guide ships into lanes and to allow ships to anticipate each other's movements. There can be special lanes – the so-called DW routes – for ships with large depth. The IMO can ratify traffic separation schemes for international waters on the basis of applications of coastal states. Routing measures mean that ships have to plan their routings in beforehand. At the moment, ships do not have to send these plans to the authorities.

The respondents were quite unanimous about traffic separation schemes and routing being effective in promoting maritime safety. 40% agreed partly and 44% strongly with the argument that existing regulation has improved maritime safety, and 43% agreed partly and 41% strongly with the claim that by developing regulation, maritime safety could be enhanced. None of the respondents would have disagreed strongly with either part of the question.

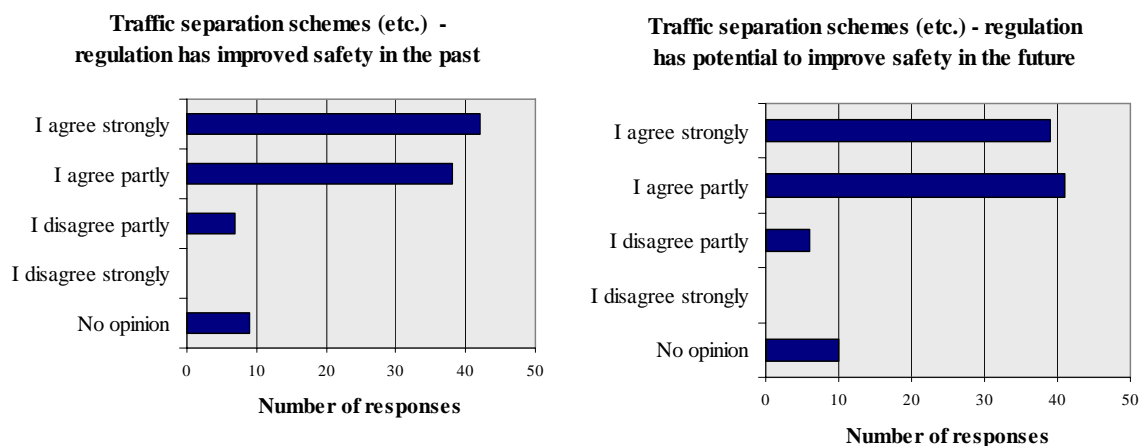


Figure 3.9. Traffic separation schemes and routing – distribution of responses

Freely worded comments:

- Traffic separation schemes are useful if all the ships follow them, especially in areas with heavy traffic. Following traffic separation schemes should be obligatory to all. (3 comments)
- The current situation is ok. There is no need for development. (2 comments)
- There is a need for more efficient traffic control in the Gulf of Finland, especially at the points of intersecting traffic. (1 comment)
- Ships can be advised for example about routing, but I think ultimately a ship should decide. (1 comment)
- The traffic separation scheme that has been taken into use in the Åland Sea is a good example of an effective risk control option. (1 comment)
- More analysis of traffic and risks is needed. (1 comment)
- No development needs. (1 comment)

Some references to the VTS system were also made, indicating that the VTS centres should have more authority in traffic control.

### 3.11 Piloting

A pilot is an expert of a specific water area and shipping, and his duty is to guide a ship master in the manoeuvring of a ship. Piloting is advisory in nature, and a master of a ship decides whether to follow the recommendations of a pilot. Piloting is regulated nationally, and there are no international conventions or regulations on pilotage.

The responses concerning piloting were at an average level compared to other questions. 43% agreed partly and 20% strongly with the claim that existing piloting practices have improved maritime safety. However, there seems to be a need for improvement, as 38.5% agreed partly and 38.5% strongly with the argument that by developing piloting, maritime safety level could be enhanced.

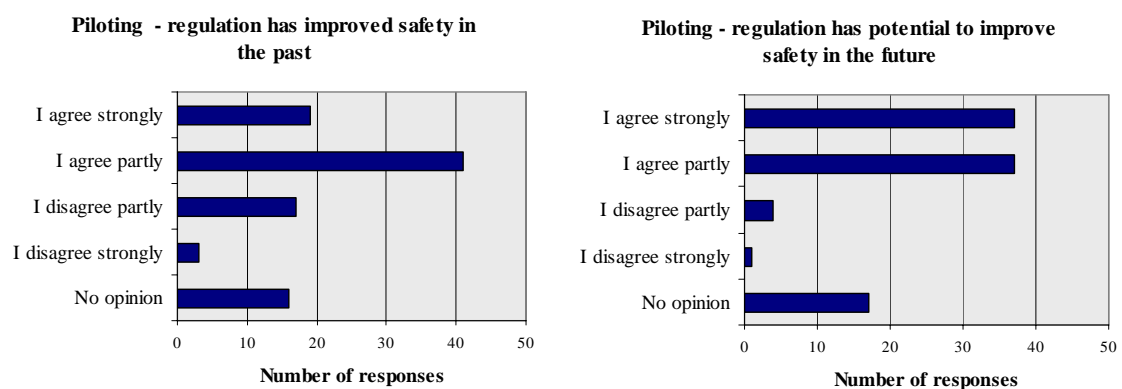


Figure 3.10. Piloting – distribution of responses

Piloting inspired a relatively large amount of comments (23) and part of these were conflicting, which reflects the fact that piloting is seen as an important issue and that the current situation of piloting in Finland gives rise to debate and diverging opinions.

- Piloting (in Finland) should be a governmental activity, and it should not involve commercial thinking. Safety should be the top one priority in piloting. (5 comments)
- Piloting should be opened to competition. (2 comments)
- Piloting resources should be increased, not decreased. Pilots have to take care of larger areas, ships have to wait longer and a pilot cannot know all the fairways equally well. There should be a stricter line in granting pilot's certificates. (6 comments)
- The professional skills of pilots should be strengthened e.g. by improving further training (e.g. technology is developing all the time, use of simulator training) and by ensuring that experienced seafarers are motivated to become pilots. (3 comments)

- More attention should be paid on co-operation with the pilot on the bridge. For example, cultural differences can prevent effective co-operation, or a pilot could make a better use of the resources available on the bridge. (3 comments)
- Piloting is not needed, at least not to the extent to which it is obligatory at the moment. Piloting resources should be channelled to ships that are new or inexperienced in the area, while those that visit regularly could be exempted from piloting. (2 comments)
- English as an official piloting language would increase safety risks because the possibility of issuing on-line pilot service licenses would be expanded, and licenses would be granted to officers who have inadequate local experience and knowledge. (2 comments)
- The official piloting language should be English. (1 comment)
- Piloting in Finland is of good quality. (1 comment)

### 3.12 Towing

Towage of ships in port areas or in entrance fairways and in emergency situations can enhance shipping safety and prevent further damages. Legislation on towing is scant. Normally, this is up to the port or the shipping company, which may want ships to be escort towed in the vicinity of ports.

In the question concerning towing, too, the responses represented an average distribution of responses. 44% agreed partly with the claim that existing practices have improved maritime safety. Also in this question, the number of those who thought that developing practices could improve maritime safety (26% agreed strongly and 43% partly) exceeds the number of those who think that existing practices have improved safety.

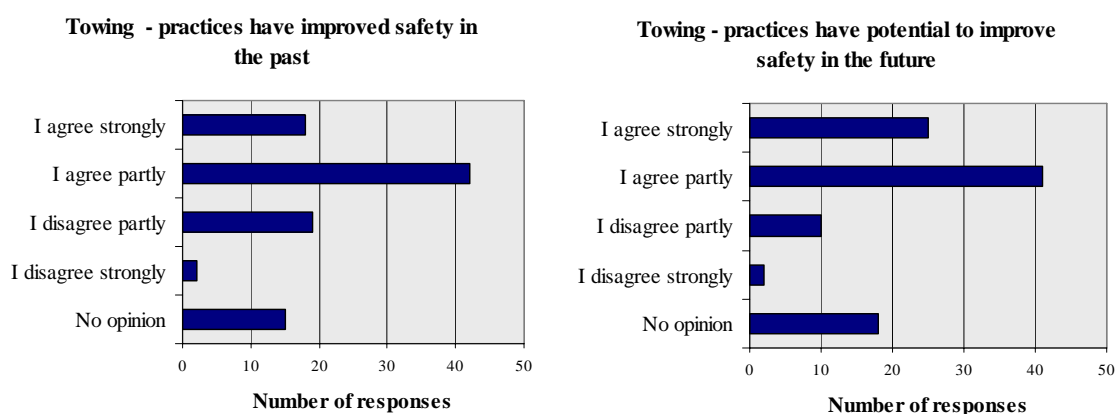


Figure 3.11. Towing – distribution of responses

Freely worded comments:

- There should be common practices for escort towing in ports, especially for tanker traffic. This would also improve the quality standard of towing and its safety. (12 comments)

- Finnish actors' towing practices are of top quality (e.g. Neste, Crystal Pool etc.). (4 comments)
- Situations where escort towing is needed should be clearly defined, e.g. due to difficult weather conditions, cargo type and amount, competence of tanker crews in local waters, ship structure etc. In short, situations that are potentially dangerous require the use of escort towing. Although if weather conditions are bad, for example, it would still be better if a ship waited for the weather to improve. (7 comments)
- Escort towing adds so much to the costs that it is rational only in situations where the risks are high. (2 comments)
- Towing in itself is a risk. Accidents have taken place in towing situations. In the vicinity of ports, ships have a low speed and in case of grounding the damages are usually not very severe. (1 comment)
- Depending on the ship's technical characteristics, towing is not necessarily needed (e.g. ships with Azipod propellers). (1 comment)

### 3.13 Fairway maintenance

The depth and breadth of fairways and their safety devices – channel alignment, buoyage and lights – are all important aspects of safe navigation. The SOLAS Convention binds states to following international recommendations on fairway marking, which are mainly issued by the IALA (International Association of Marine Aids to Navigation and Lighthouse Authorities).

Fairway marking and safety devices of fairways have an essential role in safe maritime traffic, which was also confirmed by the respondents. Not one respondent disagreed totally, and the number of those who disagreed partly was also small (4%). However, in this question it seems that the current situation is satisfying, because the number of respondents who felt that by developing fairway marking, safety could be enhanced (46% agreed strongly) was lower than the number of those who thought that existing practices have improved safety (59% agreed strongly).

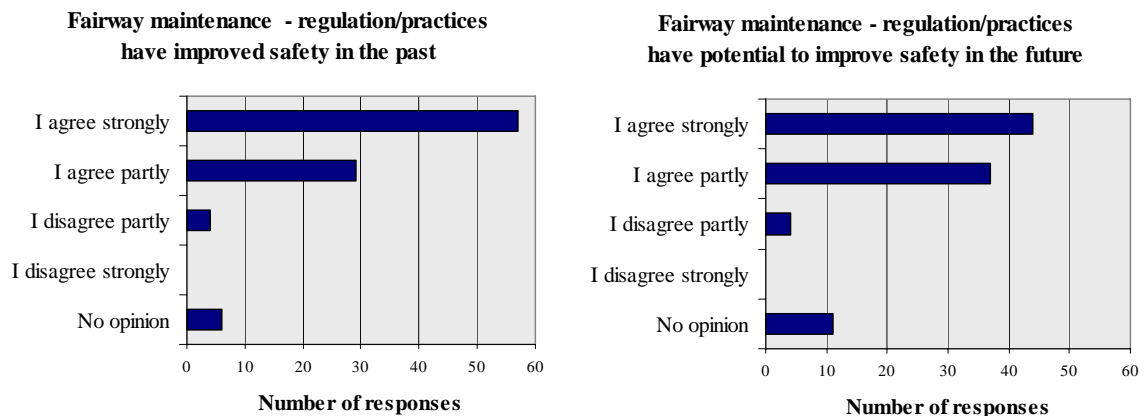


Figure 3.12. Fairway maintenance – distribution of responses

Freely worded comments:

- The quality of fairway maintenance has gone down in Finland. Repairs take too long. Fairway maintenance should be systematic and renovations should be carried out more often. The quality level of fairway maintenance should be defined more clearly in competitive tendering concerning fairway maintenance. (4 comments)
- Fairway safety is at a good level in Finland. (3 comments)
- There are too many leading marks on Finnish fairways, they can for example cause extra damage in collisions, and if they have moved, they pose risks. Instead of just marking the edges of the fairway, it would be important to mark e.g. shallow and dangerous places. (4 comments)
- Virtual fairway marking should be developed, for example ECDIS charts could include virtual buoys or information about new and temporary buoys. (3 comments)
- Administration in fairway issues lacks competence, for example cardinal marking is used in places where lateral marking should be used, or vice versa. (1 comment)
- Fairway users should be included in fairway planning at earlier stages. (1 comment)

### **3.14 Nautical charts**

Ships can use either printed or electronic nautical charts. If electronic charts are used, a ship must use an electronic navigation system (ECDIS – Electronic Chart Display and Information System) and official electronic charts (ENC), which have the type approval of the IMO. The ECDIS is going to be obligatory for all ships in the future. The contracting states of the SOLAS Convention are committed to carrying out hydrographical surveying, to gathering other relevant information, to publishing and updating nautical charts in co-operation with other countries and to following the recommendations of the IHO (International Hydrographic Organization).

The respondents also agreed on the importance of nautical charts for safe seafaring. No respondent disagreed with that principle. 65% agreed strongly with the claim that nautical charts have improved maritime safety, and 27% agreed partly. It also seems that the current situation is satisfactory, as the number of respondents who felt that by developing nautical charts, maritime safety level could be enhanced was low (42% agreed strongly).

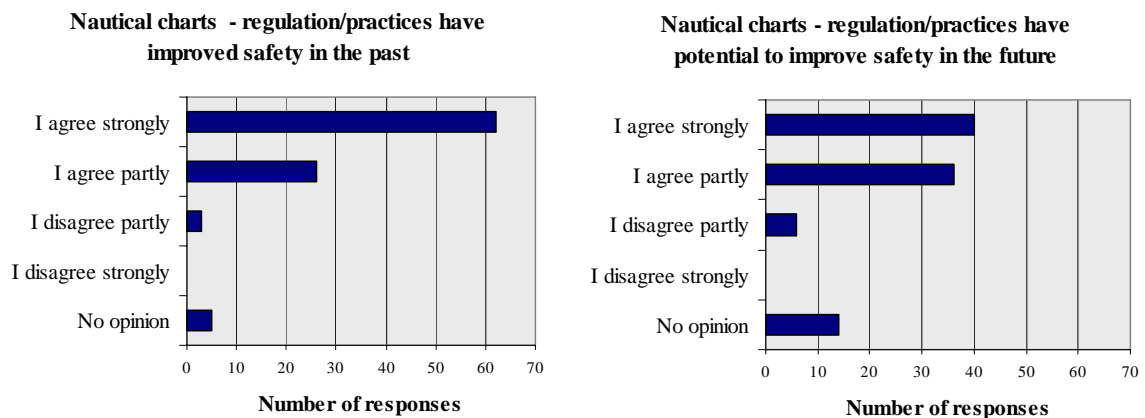


Figure 3.13. Nautical charts – distribution of responses

Free worded comments:

- Electronic charts (ECDIS) have enhanced navigation safety remarkably, and they should be developed further - their accuracy and user-friendliness could be improved. It is important to ensure that everybody using electronic charts has enough training in their use. (5 comments)
- Nautical charts are updated too infrequently in Finland. Information about errors is not disseminated fast enough. (3 comments)

### 3.15 Information sharing about navigation conditions

The contracting states of the SOLAS Convention are committed to informing the shippers of topical risks to shipping. Sea warnings are given on subjects such as the conditions of fairways and safety devices and of exceptional weather conditions. The SOLAS Convention also obliges contracting states to organize maritime weather services for shipping.

Besides fairway marking and nautical charts, information sharing about navigation conditions (such as weather, currents, water level, ice situation etc.) is also one of the basic premises of safe seafaring, and in this question, too, no respondent disagreed strongly, while 45% agreed partly and 48% strongly. However, the views of whether the development of information sharing about navigation conditions would improve safety diverged to some extent. The number of respondents who agreed strongly was slightly higher (49%), but on the other hand, some respondents disagreed partly (7%) or did not have an opinion (10%).

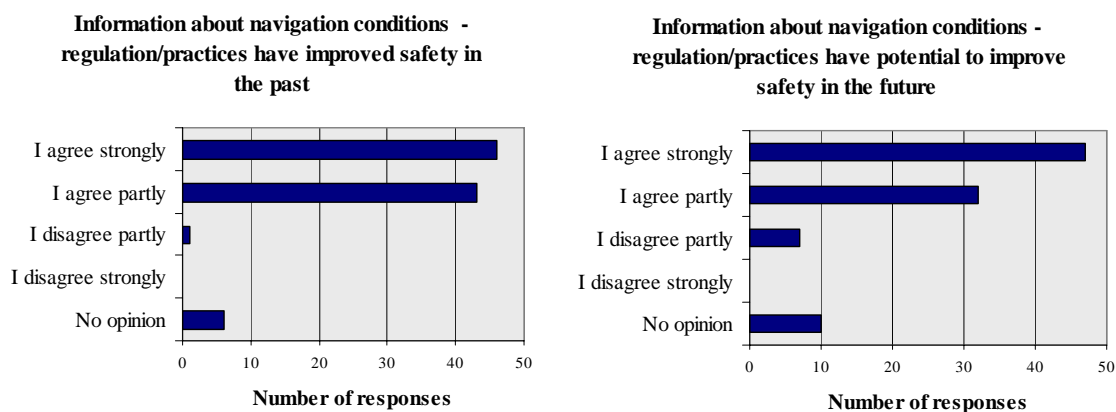


Figure 3.14. Information about navigation conditions – distribution of responses

Freely worded comments:

- Navigation related information about weather, water conditions etc. is very important from the point of view of navigation safety. Nowadays information can be shared via the Internet or through the AIS system. It is important that information is on real time. There should be more measuring buoys at seas, which would provide real-time information for ships, for example through AIS data. (10 comments)
- There is an on-going development project that concerns the automatic transmission of information through the AIS. This project is supported by the Baltic Sea Action Group. (2 comments)
- Information about navigation conditions should be in a format that can be used by ECDIS devices. (1 comment)
- Nowadays ship personnel rely too much on external information instead of taking responsibility themselves and looking out the window. (1 comment)
- Route based weather forecasts should be available for shipping, as in aviation. (1 comment)
- More easy-to-use, operational information about ice conditions is needed. (1 comment)
- Notices to mariners and NAVTEX notices should be transferred automatically to electronic charts. Currently, these have to be transferred by hand and sometimes this does not get done, because there is no time. (1 comment)
- VTS centres could be more active in providing information about navigation conditions. (1 comment)

### 3.16 Fairway and port dues

Most states collect fairway dues from merchant ships in their territorial waters, for example to cover the expenses of fairway maintenance and maritime administration. States have different calculation methods of fairway dues, e.g. in Finland fairway dues are mainly calculated on the basis of the net weight and ice class of a ship. Port dues are primarily dues that a port charges for its services, but they also have characteristics of a

policy instrument, e.g. obligatory waste management fees, and in Sweden port dues have been used to decrease air pollution from shipping.

Compared to the other questions, the respondents showed themselves significantly more sceptical about fairway and port dues having done anything to improve safety (25% agreed partly and only 3% agreed strongly). The number of respondents who felt that these dues could improve safety if their determination or the way in which fairway or port due revenues are used were developed was slightly higher (36.5% agreed partly and 8% agreed strongly). Compared to most other questions, the number of respondents selecting “no opinion” and those who disagreed strongly (9% in existing regulation and 7% in future regulation) was also higher. This also was the question where the responses were the most divided between the different options in both parts of the question.

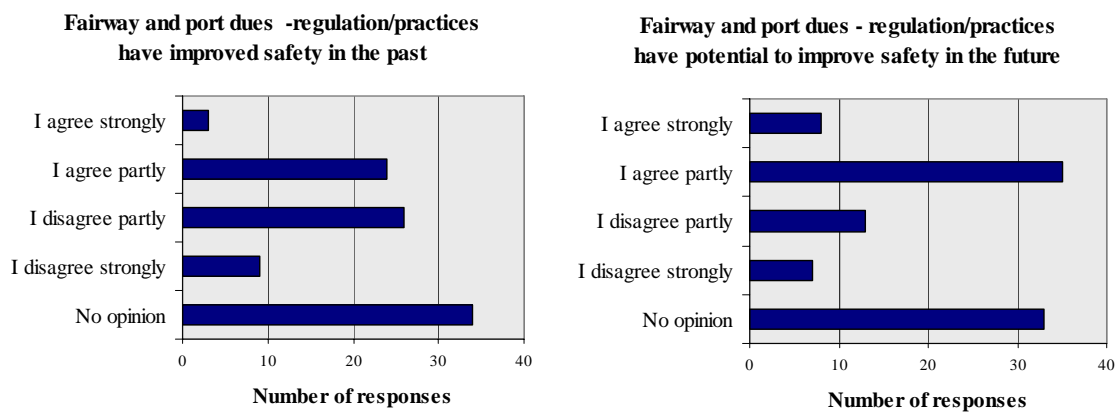


Figure 3.15. Fairway and port dues – distribution of responses

The respondents either felt that the safety effect of fairway and port dues was relevant to the maintenance of fairways (to which fairway dues are used in Finland) or that the determination of dues should be done on the basis of some ship characteristics that affect safety.

- The following suggestions were made about the determination of fairway or port dues: 1) fairway dues should be determined on the basis of the number of officers (in order to reduce fatigue), 2) on the basis of the amount of NO<sup>x</sup> and SO<sup>x</sup> air emissions of a ship, 3) “a good ship can pay less”, 4) ships that operate only in summer should have lower fairway dues, 5) ships that have passed inspections without problems should have lower fairway dues, which would reward shipping companies that invest in safety, 6) if it were possible to support Finnish ships, this would increase safety. ( 5 comments)
- If fairway dues were determined on the basis of the costs of fairway maintenance and piloting dues based on working hours, this would even out the competition between ports, and the environmental friendliness of the transportation chain could be improved. (1 comment)
- Stand by due of tugs should be included in port dues. (1 comment)
- The “user pays” principle is good. (1 comment)

### 3.17 Marine insurance

Marine insurance is intended to cover the loss of or damage to ships, cargo and any means of transport or property by which cargo is transferred from one place to another by sea. Marine insurance is usually split between the ships and their cargoes. Marine insurance is in most cases voluntary for a shipowner, but the International Convention on Civil Liability for Oil Pollution Damage of the IMO obliges oil carrying ships to have a mandatory insurance.

The distribution of the responses was similar as in the previous question about fairway and port dues. A slightly higher number of respondents agreed partly with the claim that existing practices have improved safety (39%) and that by developing marine insurance, maritime safety levels could be enhanced (36.5% agreed partly, 12.5% agreed strongly). But as in the previous question, over 30% of the respondents chose “no opinion”, which probably reflects the fact that many of the respondents were not particularly familiar with marine insurance issues.

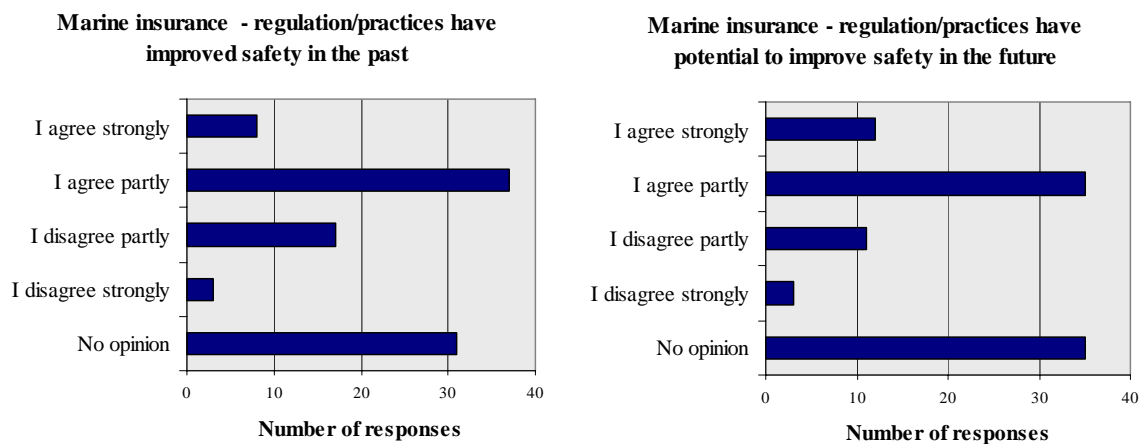


Figure 3.16. Marine insurance – distribution of responses

Freely worded comments:

- Good (technical and working) conditions on a ship should decrease marine insurance fees and thus create an incentive to improve safety. (2 comments)
- Development of the marine insurance system at the global level might have a positive effect on maritime safety, especially if it included some kind of inspection activities. (1 comment)
- The role of flag states should be increased in connection of marine insurance fees (e.g. number of accidents). (1 comment)
- There should be more discussion about the role of marine insurance, because insurance is part of distribution of costs. (1 comment)

### 3.18 P&I Clubs

P&I (Protection & Indemnity) insurance clubs are associations of ship-owners formed for the purpose of protecting and indemnifying themselves against claims (such as those arising from pollution, death or injury to crew or passengers and loss of cargo) by others on a mutual basis. P&I Clubs are non-profit making organizations, as compared to market insurances. In the P&I Club, each ship-owner pays the insurance premium, the amount of which depends on claims made by all the other members of the club. It is in the interest of members to have as low a premium as possible, which creates a mutual interest to maintain high safety and environmental standards. (Bennett 2001)

The question concerning P&I Clubs provoked the highest rate of “no opinion” answers (over 40% for both questions), which probably reflects the fact that the respondents were not very familiar with P&I clubs. Otherwise, most of the respondents chose “I agree partly” – 32% for existing practices and 38% for future potential. The P&I question was also the one that inspired the lowest number of freely worded comments (3 comments).

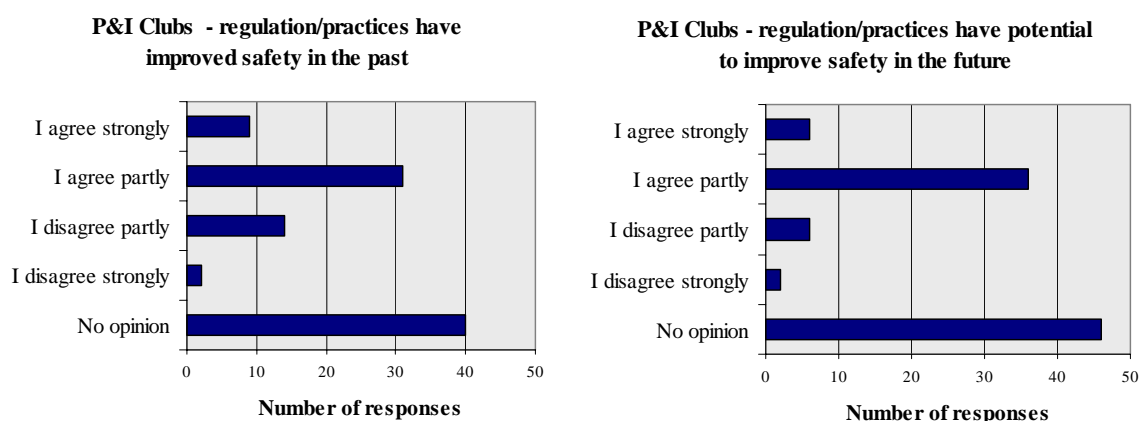


Figure 3.17. P&I Clubs – distribution of responses

Freely worded comments:

- Experiences or case studies of P&I Clubs could be disseminated more widely in the shipping industry. They could make people think of how they have dealt with similar issues. (1 comment)
- Development of P&I Club system at the global level might have a positive effect on maritime safety. (1 comment)
- P&I Clubs could improve the willingness of masters to accept help (more mutuality). (1 comment)

### 3.19 Financial liability for oil damages

The International Convention on Civil Liability for Oil Pollution Damage of the IMO enacts that a ship must have an obligatory insurance and that an injured party is entitled to apply for compensation directly from an insurer. The liability of a ship-owner is

limited and is determined by the net tonnage of the ship. If the costs of oil pollution are more than the limitation of liability (for a ship over 140,000 gross tonnage: about Eur 106 million in 2008, or 89.77 million SDR = Special Drawing Right) (IMO 2010a), they are covered from the oil pollution fund based on the Establishment of an International Fund for Compensation for Oil Pollution. Fees for the oil pollution compensation fund are based on the amount of oil transported, and they are usually paid by the receiver of oil cargo. If the incident has occurred as a result of actual fault or carelessness, the shipowner becomes fully liable for the damage.

In this question, 49% agreed partly with the claim that existing regulation has improved maritime safety. Of course, liability questions do not affect safety of navigation in the same way as e.g. nautical charts, but they can to some extent create pressures for shipowners to take good care of safety issues. Liabilities could add to this pressure in the future, because the number of respondents who felt that by developing regulation maritime safety could be improved was higher (42% agreed partly and 24% strongly).

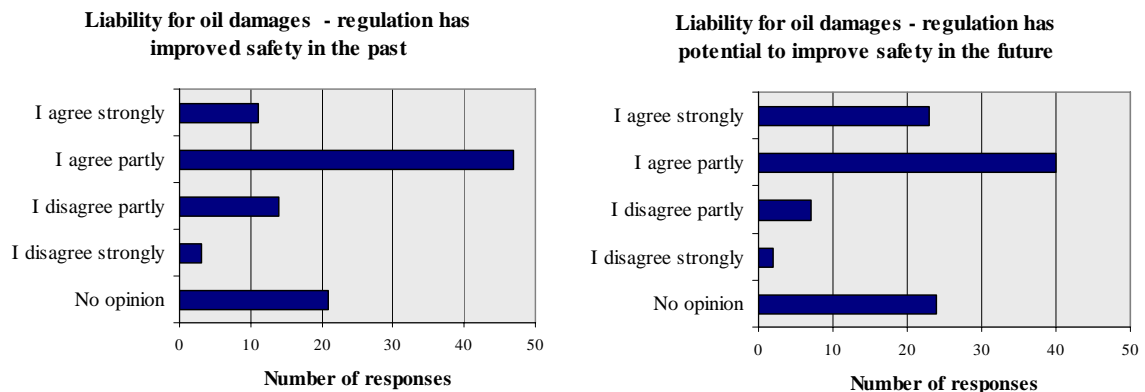


Figure 3.18. *Liability for oil damages – distribution of responses*

Freely worded comments:

- Cargo owners should bear a greater liability. This would increase their interest in the kind of ships they use for transportation. (1 comment)
- There should be an international level of liability, which would apply both to accidental and intentional discharges. (1 comment)
- The “polluter pays” principle should apply. (1 comment)
- If liabilities for shipping companies were larger, this would increase the interest of marine insurance companies to promote safety. (1 comment)

### 3.20 Culpability and criminal sanctions in oil damages

Culpability and criminal sanctions in oil damages refer to penal responsibility and consequences resulting from it.

In this question, a clear tendency was that the existing regulation has not improved safety as much as it could: the question about existing regulation elicited a relatively

high number of “I disagree strongly” (4%) and “I disagree partly” (25%) responses, and many responded “I agree partly” (42%) and “I agree strongly” (23 %) to the question about future development potential. Still, culpability and sanction issues do not affect the safety of maritime operations in the same straightforward way as e.g. nautical charts or traffic separation schemes, but their preventative effect depends on acting as a deterrent, explaining why more respondents answered “I agree partly “ than “I agree strongly”.

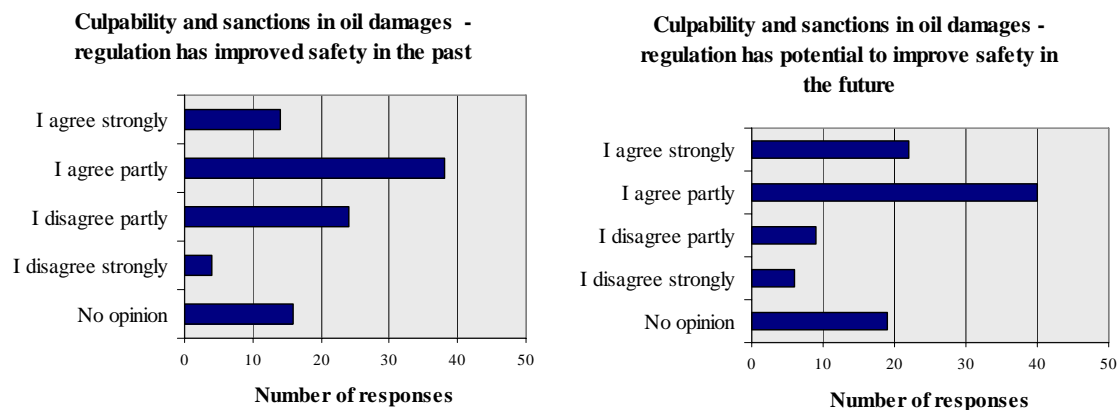


Figure 3.19. Culpability and sanctions in oil damages – distribution of responses

Freely worded comments:

- Culpability and sanctions should also target cargo owners, management of shipping companies and the whole transport chain instead of officers on board, or in other words those who are responsible for the transportation of cargo and for the ship and its conditions. Only if oil damage was due to the intent or carelessness of an officer or a crew member, culpability and sanctions should focus on him/her. (7 comments)
- Sanctions must be severe enough to have a preventive effect. (2 comments)
- Culpa liability issues should not lead into covering up of accidents. (1 comment)
- There should be an international level of culpa liability and sanctions. (1 comment)

### 3.21 Economic incentives

The idea of economic incentives is to diminish costs for actors capable of proving that they operate in a way that is safer than the normal practice, and thus also encourage other actors to improve their operation. In the shipping industry, economic incentives often target the ship-building industry, but there are also other incentive systems in use, although not on such a large scale. For example, in the Green Awards Certification System, certified ships are granted a reduction in port dues in ports that have joined the system (Green Award 2010).

47% of the respondents agreed partly and 23 agreed strongly that economic incentives have improved safety. A slightly larger share felt that economic incentives could be used to promote safety in the future: 32% agreed strongly and 43% partly.

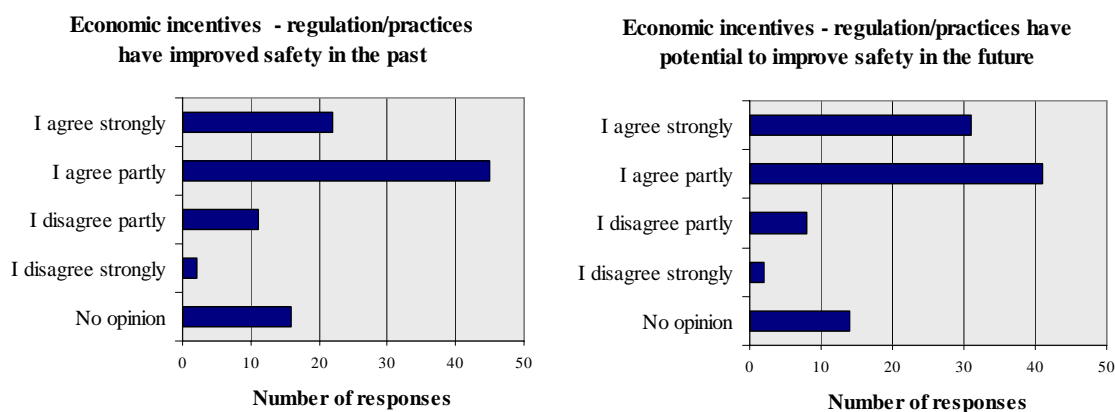


Figure 3.20. *Economic incentives – distribution of responses*

The freely worded comments focused mostly on incentives for the ship-building industry.

- Incentives for ship-building should be targeted at such technical solutions in ships and ports that promote safety, including environmental safety. Currently, incentives mainly target the prevention of unemployment. (6 comments)
- Economic incentives often are protectionist, but this is inevitable if we wish to promote safety. (1 comment)
- Investments should be targeted at quality. Nowadays especially longevity is not so important in shipbuilding, and ships are not built to last. (1 comment)
- Innovations have been an important part of the Finnish marine industry, and there should be no economical barriers to prevent future development. (1 comment)

### 3.22 Information about safe shipping

Information about safe shipping means public information guidance, such as IMO codes, guidelines or recommended practices, which are not legally binding. Information about safe shipping can also include voluntary training, best practice cases, awards and Internet services, such as the [baltice.org](http://baltice.org), which contains information about winter navigation in the Baltic Sea. Information guidance is based on the self and mutual governance of actors instead of binding jurisdiction, and the goal of information guidance is to affect the behaviour of citizens or companies by sharing information.

The results produced by the question about the role of information in safe shipping were slightly surprising, as it elicited the largest share of “I agree partly” answers (58%), and the total share of “I agree partly” and “I agree strongly” answers was 83%. This was surprising because the effect of information guidance depends on the voluntary interest shown by the actors. It is tempting to think that if we wish for some policy to be

effective, it must be based on legislation or otherwise made obligatory. However, this seems not to be the opinion of the respondents to this questionnaire. It may also be possible, and even likely in the light of some comments, that part of the respondents thought information about safe shipping meant information about navigation circumstances (weather etc.) concerned in question 18 (Chapter 3.15). The meaning of this question should probably have been defined better in the questionnaire.

In the question about the future potential of information to improve maritime safety, the share of “no opinion” answers was slightly higher (14%) and that of “I agree partly” or “I agree strongly” answers lower (total 80%).

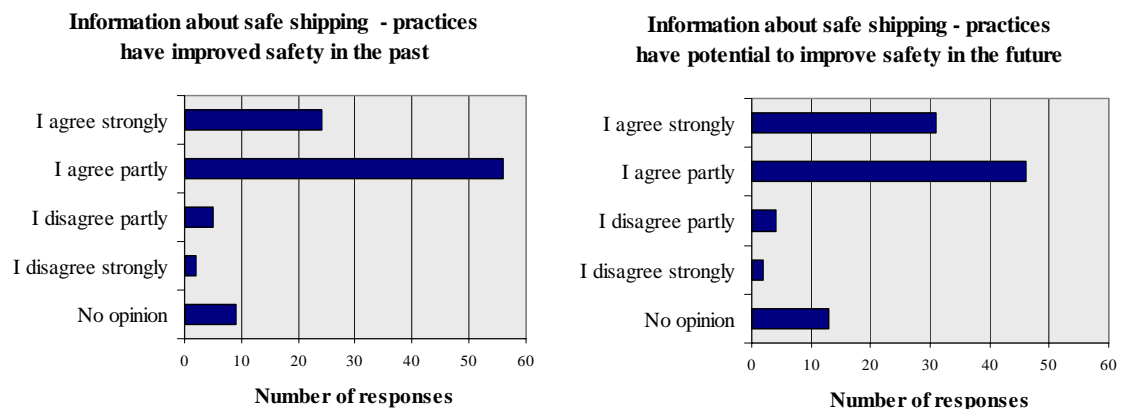


Figure 3.21. Information about safe shipping – distribution of responses

Freely worded comments:

- If there is too much information, relevant facts might be dismissed. (2 comments)
- Informative training and seminars, which would include information about the regulations, the kind of accidents that have happened and how operations onboard are performed safely, should be organized for seafarers. (2 comments)
- Information should also be directed to the users of logistics services. (1 comment)

### 3.23 Spontaneous activity of companies

Spontaneous activity of companies can include any safety promoting measures that a company takes voluntarily and spontaneously. It can for example include the implementation of quality systems, allocating resources to safety or voluntarily implementing technical solutions that enhance safety.

The role of spontaneous activity of companies in promoting maritime safety got very high scores of “I agree strongly”, both in the question about the past (58%) and the future (58%). As a total of “I agree partly” and “I agree strongly” answers to the question about the future potential, this question collected the highest score (92% of the respondents) of all the alternatives.

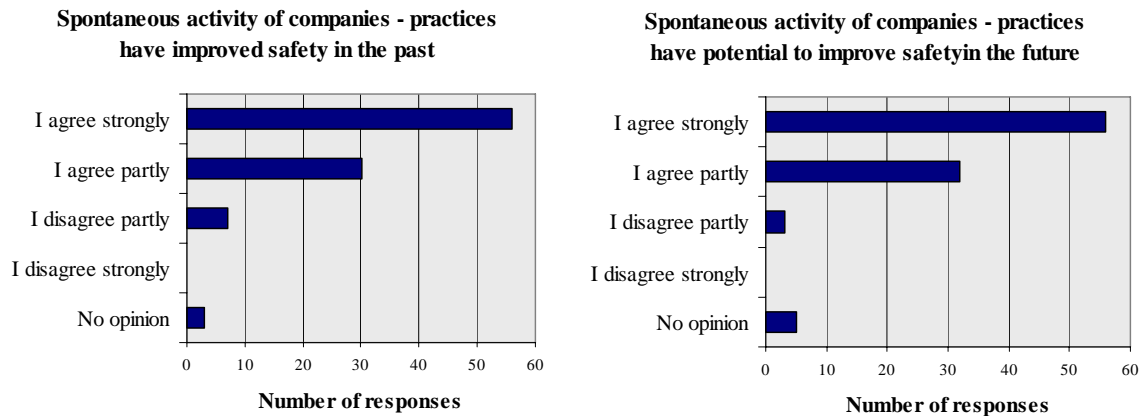


Figure 3.22. *Spontaneous activity of companies – distribution of responses*

Freely worded comments:

- Spontaneous improvement is the most effective way to improve safety, but it often requires economic resources. The safety culture on a ship is greatly affected by the initiatives and attitudes of the company. If a company and its personnel are motivated and committed to safety, regulations are not necessarily needed. (4 comments)
- Unfortunately, spontaneous activities of shipping companies too often mean that there is one more checklist and one more file in the bookshelf while nothing else changes. For example, design of work premises and equipment safety can achieve more improvements than having a quality system. (2 comments)
- Spontaneous safety activities of companies add to their positive image. (1 comment)
- All that improves safety is good as long as it does not cause more paperwork. (1 comment)
- Shipping companies should supervise their ships and intervene in faults. (1 comment)

### **3.24 Summary**

In almost all the questions about the 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%. Based on this, we can conclude that in most cases, different kinds of policy instruments that are used to enhance maritime safety are necessary and they have been effective. Economic instruments have been used less for maritime safety purposes, and the respondents perceived that their effect on the maritime safety level has been minor compared to regulatory instruments.

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”. And in this case, too, 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 general conclusion is that maritime safety regulations and risk control options are needed in all issues that are regulated in some manner at the moment. However, some issues emerge in the results, as we compare the results produced by each question to each other. Figures 3.23 and 3.24 contain a summary of questions 5-26 (Chapters 3.1 - 3.23) and their response distributions in percentages.

In the question about the past effectiveness, 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. The conclusion to be drawn is that fairway and port dues have not improved maritime safety, although we should keep in mind that the number of “no opinion” answers was relatively high as well.

Ship construction and equipment, fairway maintenance, nautical charts, traffic separation schemes and routings and spontaneous 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 smallest numbers of “no opinion” answers were given in the questions concerning “ship construction and equipment” and “spontaneous activity of companies”, and the highest number of “no opinion” answers was given in “P&I Clubs”.

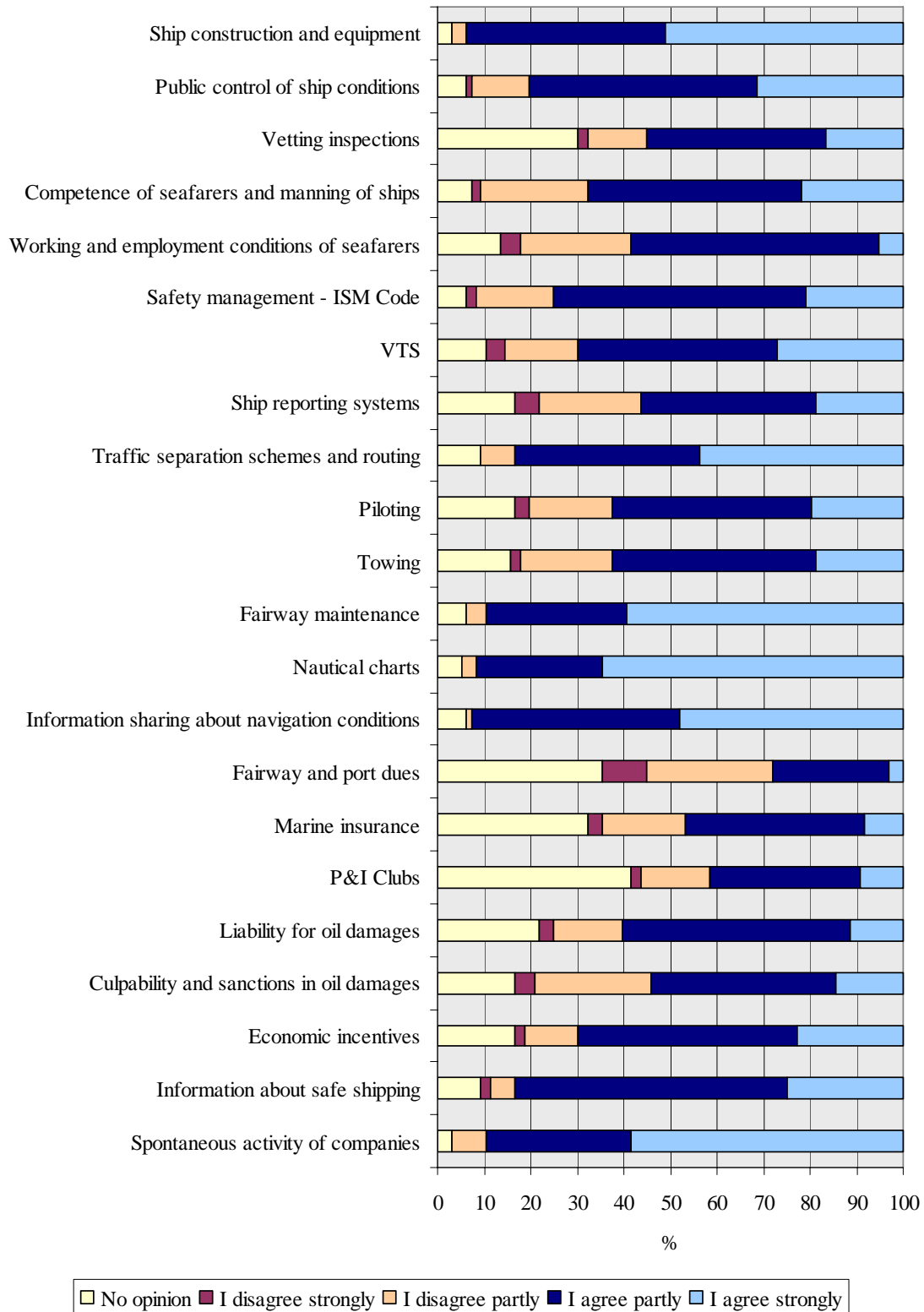


Figure 3.23. Summary of results – current regulations/practices have improved safety

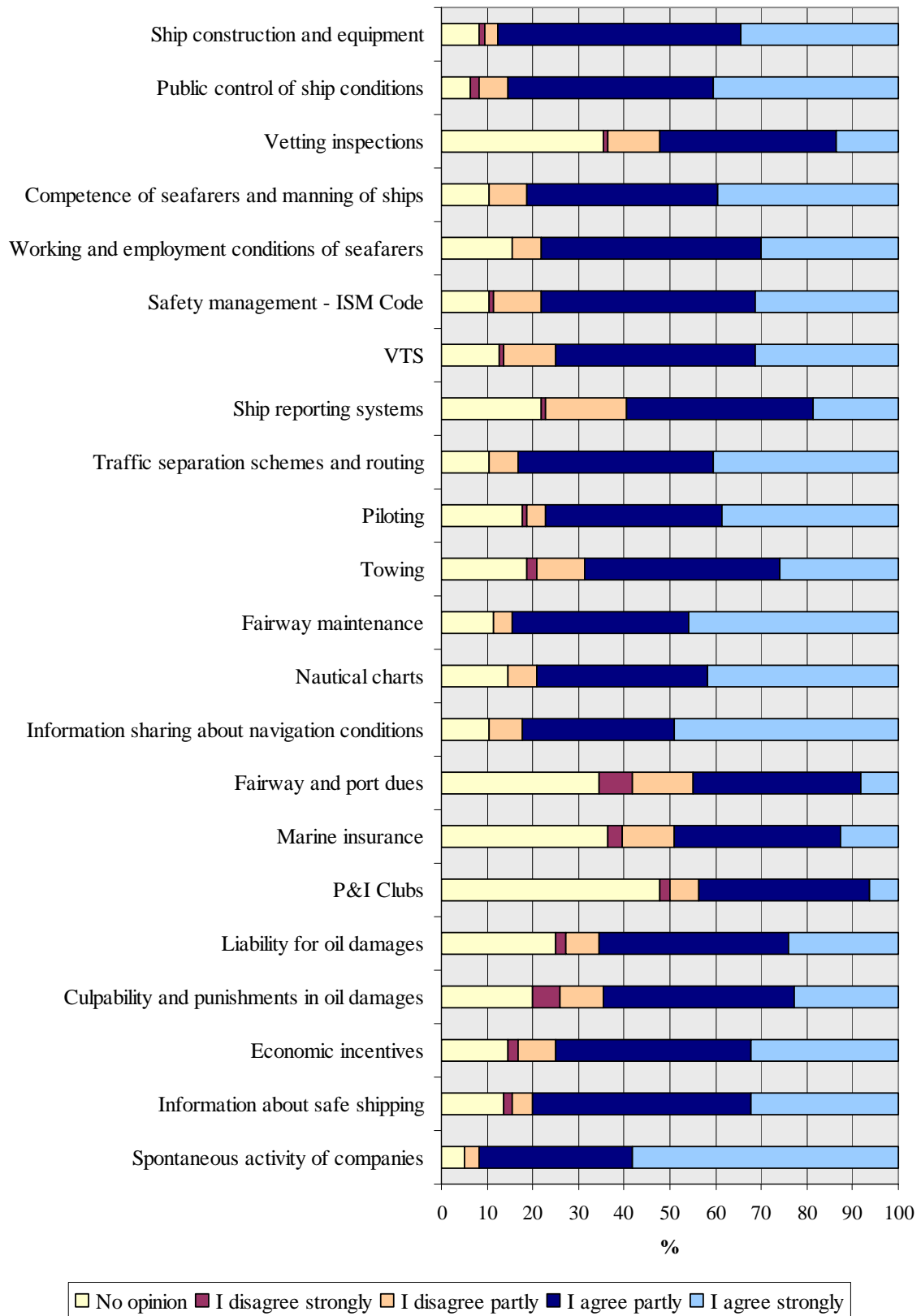


Figure 3.24. Summary of the results – development of regulations/practices could enhance maritime safety level in future

What kind of measures would be the best in order to enhance the maritime safety level in the future? Spontaneous 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 we can thus conclude that these issues also will be very important for maritime safety in the future.

The lowest number of “no opinion” answers was produced by the questions about “spontaneous 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”.

### **3.24.1 Grouping of policies**

In the following, policies have been divided into five different groups: 1) policies which have been important for the improvement of the maritime safety level and which also have potential for future development, 2) policies which have not been particularly successful in improving the maritime safety level in the past but which could improve the maritime safety level in future, 3) policies which have been important for the improvement of the maritime safety level but which do not have much potential for future development, 4) policies which have not been important for the improvement of the maritime safety level and which do not have much potential to improve the maritime safety level in the future either, and 5) policies which have been relatively important for the improvement of the maritime safety level (=response distribution follows the average level of responses) and which have about the same potential to improve the maritime safety level in the future.

The grouping of policies is done by calculating an arithmetic mean for each question and by comparing means with each other (see Figure 3.25). Higher the mean is, more there are “I agree strongly” or “I agree partly” answers. The number of “no opinion” answers was not taken into consideration in the calculation of means.

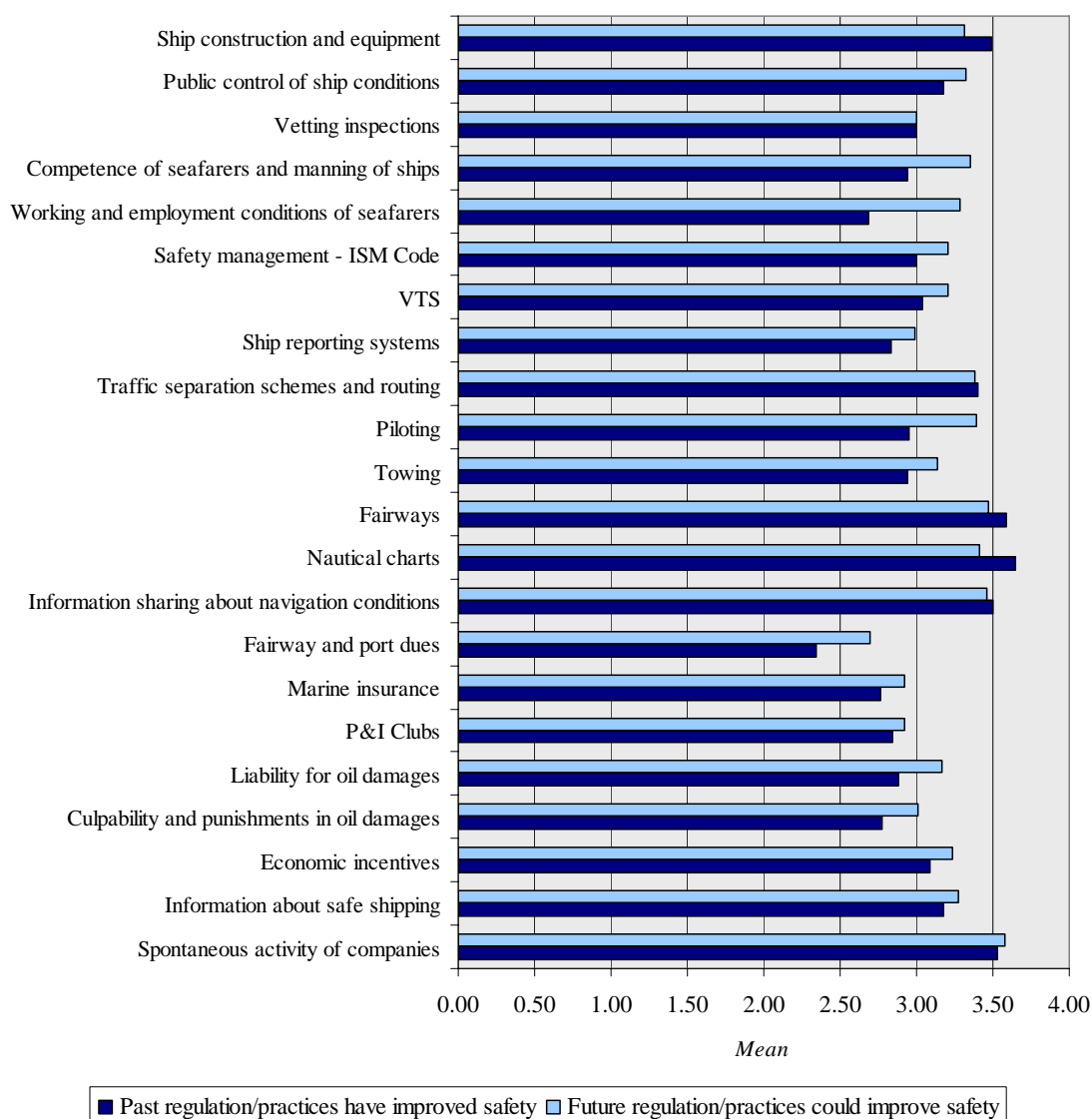


Figure 3.25. Summary of the results - means

Policy instruments which had a mean equal to three or more in the question about past effectiveness were categorized into “policies, which have been important for the improvement of the maritime safety level”. These policy instruments were further categorized into two groups on the basis of their future potential: “policies which have been important for the improvement of the maritime safety level, and which also have potential for future development”, or “policies which have been important for the improvement of the maritime safety level, but which do not have much potential for future development, or in other words the current regulation/practices are perceived to be of a relatively good quality”.

Policy instruments, which had the largest difference between the means in the questions about past effectiveness and future potential, were categorized into “policies which have not been particularly successful in improving the maritime safety level in the past but which could improve the maritime safety level in the future”.

Policy instruments, which had the mean under three in both questions, were categorized into “policies which have not been important for the improvement of the maritime safety level and which do not have much potential to improve the maritime safety level in the future either”. The remaining three policies were categorized to “policies which have been relatively important for the improvement of the maritime safety level (=response distribution follows the average level of responses) and which have about the same potential to improve the maritime safety level in future”.

1) Policies which have been important for the improvement of the maritime safety level, and which also have potential for future development:

- Public control of ship conditions
- ISM Code
- VTS
- Traffic separation schemes and routing
- Economic incentives
- Information about safe shipping
- Spontaneous activity of companies.

2) Policies which have not been particularly successful in improving the maritime safety level in the past but which could improve the maritime safety level in the future:

- Competence of seafarers and manning of ships
- Working and employment conditions of seafarers
- Piloting
- Fairway and port dues.

3) Policies which have been important for the improvement of the maritime safety level, but which do not have much potential for future development, or in other words the current regulation/practices are perceived to be of a relatively good quality:

- Ship construction and equipment
- Fairway maintenance
- Nautical charts
- Information sharing about navigation conditions.

4) Policies which have not been important for the improvement of the maritime safety level and which do not have much potential to improve the maritime safety level in the future either:

- Ship reporting systems
- Marine insurance
- P&I Clubs.

5) Policies which have been relatively important for the improvement of the maritime safety level (=response distribution follows the average level of responses) and which have about the same potential to improve the maritime safety level in future:

- Vetting inspections
- Towing

- Liability for oil damages
- Culpability and sanctions in oil damages.

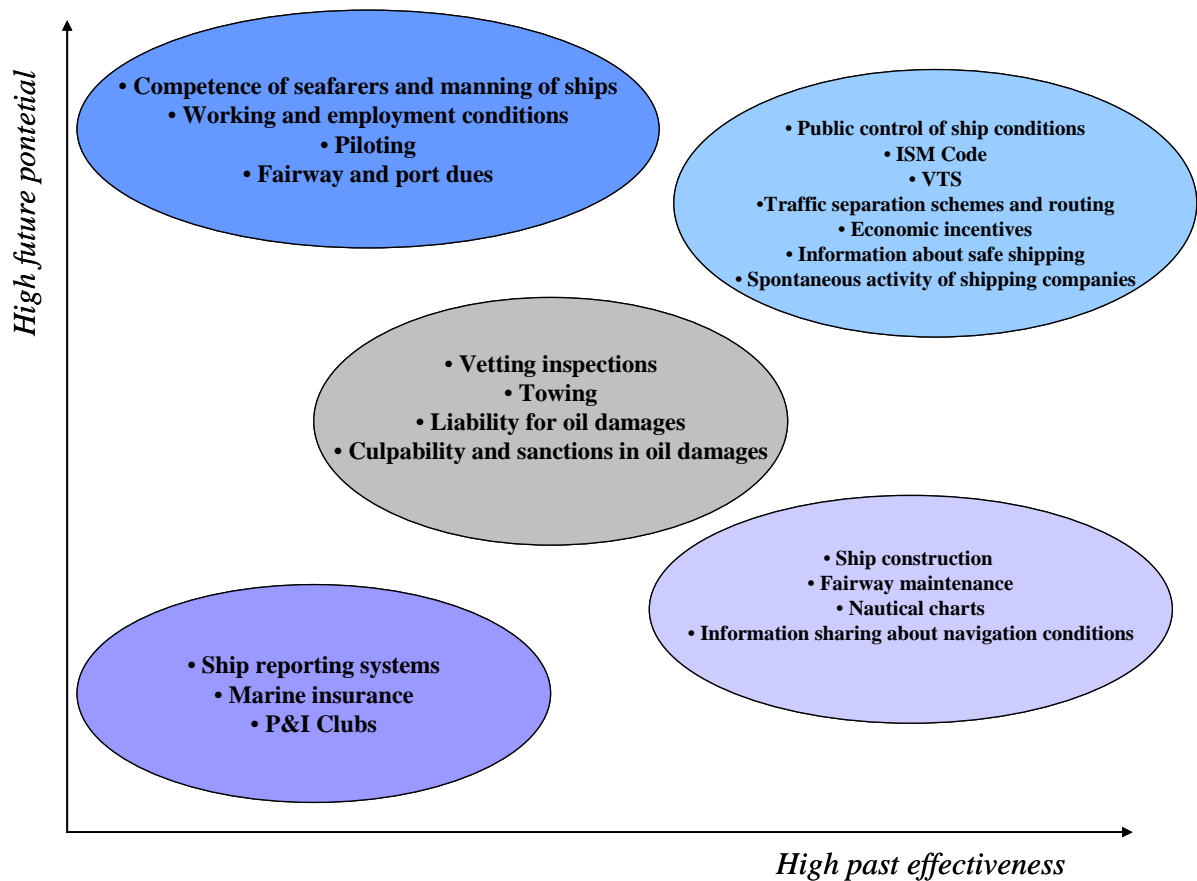


Figure 3.26. The grouping of policies according to their past effectiveness and future potential

Spontaneous activity of shipping companies will be the most effective way to improve maritime safety in the future. The competence of seafarers and manning of ships, working and employment conditions, piloting and fairway and port dues are also issues that seem to have good development potential. Public control of ship conditions, ISM Code, VTS, traffic separation schemes, economic incentives and information about safe shipping are important, but their development potential compared to the current state of regulation/practices is not as good as that of the previously mentioned issues. Ship construction and equipment, fairway maintenance, nautical charts and information about navigation conditions are all very important for maritime safety, but they seem to be relatively well taken care of at the moment.

## 4 MARITIME SAFETY IN THE GULF OF FINLAND

### 4.1 Prevention of an oil accident in the Gulf of Finland

The possibility of an oil accident in the Gulf of Finland due to the large amount of oil cargoes (over 50% of all cargoes transported by sea) is a concern that is often expressed. In this question, the respondents were asked if they think that more action is needed to prevent an oil accident especially in the Gulf of Finland, or if they feel that all necessary actions have been taken, or that too many actions have been taken. They were also asked to explain what kind of actions they meant. However, not all respondents elaborated on their answer.

77% of the respondents felt that more actions are needed to prevent an oil accident. 8% were of the opinion that all effective actions have already been taken, and only 2% were of the opinion that there have been too many actions to prevent an oil accident. 12.5% did not have an opinion on the matter.

Some 20 different measures were proposed to prevent an oil accident in the Gulf of Finland. The largest number of references (19) was made to the development of a traffic control system in the Gulf of Finland, which in most cases meant the extension of the VTS centre's authority. Further development of the GOFREP system was also mentioned several times. The second largest number of references (17) was made to the extension of piloting obligations. The third-most frequent was increasing the oil combating capacity (10 references). The oil combating capacity was not dealt with elsewhere in the questionnaire, because the focus was on policy instruments and risk control options that can be used to prevent an accident.

Actions that were proposed to prevent an oil accident were the following:

- Development of the vessel traffic system/traffic control operations (e.g. increasing the powers of the VTS centres, development of the GOFREP system, special control of large tankers, the Russian VTS should be more active). (19 references)
- Extension of pilotage obligations (e.g. the use of Baltic Sea pilots was mentioned three times, Baltic Sea Pilots should be used in large tankers or if a tanker master has not been operating in the GoF or in the Baltic Sea). (17 references)
- The oil combating capacity must be extended. (10 references)
- Development of towing/emergency towing practices. (5 references)
- Development of technical requirements for ships. (5 references)
- Development of competence and experience requirements for officers/crew. Skilful and motivated crew for ships. (5 references)
- Development of safety management systems and focus on the human factor. (4 references)
- Stricter sanctions for incidences of misconduct. (2 references)

- Ports of refuge (e.g. discussion about their locations). (2 references)
- Better co-ordination of actions that are developed to improve maritime safety in the GoF. (2 references)
- Extension of route planning. (2 references)
- Dedicated DW lanes for oil tankers. (2 references)
- Reduction of bureaucracy and paperwork. (1 reference)
- There are too many registration points in the GoF. (1 reference)
- Fleet renewal. (1 reference)
- Increase of rescue equipment. (1 reference)
- More control of dry cargo transports as well, also bunker oil is a risk. (1 reference)
- Development of winter traffic safety. (1 reference)
- Better lane distribution in the eastern part of the Gulf of Finland. (1 reference)
- ENSI project of John Nurminen Foundation (information exchange system). (1 reference)

Those who said that the actions taken to prevent an oil accident were excessive did not elaborate on their opinion.

#### **4.2 Risk factors of maritime safety in the Gulf of Finland**

This question listed possible risk factors for maritime safety in the Gulf of Finland with the idea of finding out what the most significant risk factors are according to the respondents. In addition to the multiple choice options, the respondents could also name other risk factors.

The results indicate (see Figure 4.1) that the fatigue of seafarers is the most important risk to maritime safety. The following three most important risks are the safety culture both on ships and in shipping companies and breaking the sea route rules. Information about navigation circumstances (weather, currents, ice situation etc.) is the smallest risk of the given options. Other risks that are small are the conditions and placement of safety devices, the quality of nautical charts and congestion in fairways. The most even distribution of responses was found in the complexity of maritime safety legislation.

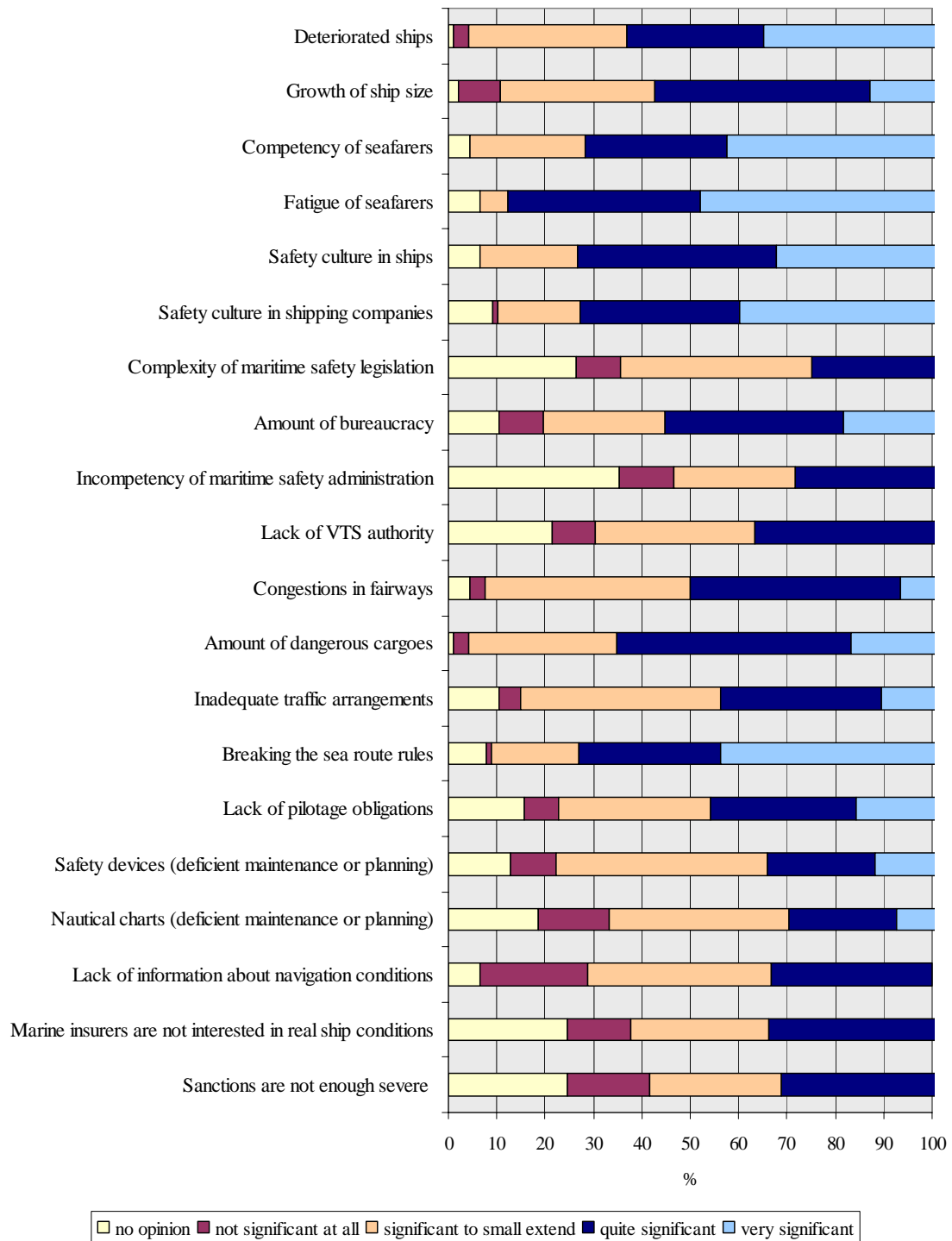


Figure 4.1. Risk factors of maritime safety in the Gulf of Finland

The following open question about other risks to maritime safety in the GoF produced 22 comments. Some of the comments were concerned less with risk factors and more with things that should be done to improve maritime safety. Below, the comments are grouped into human factor related risks, navigation related risks, risks related to navigation circumstances in the Gulf of Finland and other risk factors. The human

factor related risks were the greatest concern, e.g. lack of competence and motivation of seafarers. VTS operations and pilotage were also mentioned several times.

#### ***Human factor related risks***

- Competence of seafarers (language skills, education, training). (3 comments)
- Number of maritime personnel decreases and amount of duties grow. This leads to fatigue and negligence. (2 comments)
- Motivation of maritime personnel. (1 comment)
- Communication problems due to a lack of language skills. (1 comment)
- More focus on how motivated and skilful people could be attracted to seafaring occupations. (1 comment)
- Competence problems of authorities and VTS operators (lack of seafaring experience). (1 comment)
- Safety perceptions of different nationalities. (1 comment)
- High turnover of workers between ships and shipping companies. (1 comment)
- Following the situation in monitors is monotonous and can easily lead into inattentiveness. Automatic monitoring of dangerous situations should be increased. (1 comment)
- Greed of shipping companies and shippers. This leads to skeleton crews and the use of cheap labour with crew members who do not have the competence or encouragement/do not have an interest in engaging in safety promoting actions onboard. (1 comment)
- The most important risk factor is human. Welfare and competence are important issues. (1 comment)

#### ***Navigation related risks***

- If English is accepted as a language for pilot on-line service licenses, risks will increase, because licenses will then be granted too easily for officers who are not familiar enough with local circumstances. (2 comments)
- The VTS should have more authority to control ships. (1 comment)
- Current pilotage practices involve several risks. (1 comment)
- Separation of VTS operations, ice breaking and pilotage was not a good solution and undermined safety. Commercial thinking is not compatible with these issues. (1 comment)

#### ***Risks related to navigation circumstances in the Gulf of Finland***

- Challenges of winter navigation (special circumstances, inexperienced crews). (3 comments)
- Building of gas pipeline. (2 comments)
- Crossing passenger traffic line between Helsinki and Tallinn. (1 comment)

#### ***Other risk factors***

- Quality of equipment on ships. (1 comment)
- More icebreakers are needed. Multi-purpose icebreakers are not suited to icebreaking. (1 comment)

- All flag states should have the same standards of implementation and monitoring of safety regulation. (1 comment)

The answers to this question support the conclusions made in Chapter 3.23 about the answers to questions 5-26. Human factor related risks are the most prominent one, and the most important way to decrease the role of human error is the spontaneous activity of shipping companies. From the point of view of safety, it would be important for a shipping company to have motivated, competent and committed personnel and enough employees onboard. VTS and piloting also stood out as their role in maritime safety provoked many opinions.

The smallest risks were associated with such as nautical charts, fairway maintenance and safety and information sharing about navigation conditions, which were also the issues which were perceived to have the smallest development potential to improve maritime safety in the future.

## **5 EFFECTIVENESS AND WEAKNESSES OF THE MARITIME SAFETY POLICY SYSTEM**

In this Chapter, we will compare the findings of the literature study (Kuronen & Tapaninen 2009; 2010) with the results of the questionnaire study on the effectiveness of maritime safety policy system and its weaknesses. Firstly, we will discuss the findings of the literature study and look at three aspects of the maritime safety policy system: international maritime safety regulation, the role of the human factor and safety management, and third party involvement. Secondly, we will analyse the same three aspects and compare these to the literature study based on the results of the questionnaire study.

### **5.1 Main conclusions of the literature study**

Although the number of maritime casualties and their level of seriousness have decreased and maritime safety regulations have improved maritime safety, undesirable phenomena still exist in the shipping industry that erode maritime safety policy. The maritime safety policy system can be criticized on many points. Most of these are interconnected, reflecting the fact that the safety problems ultimately lie in the foundations of the system and of the shipping industry.

#### **5.1.1 Critique of international maritime safety regulation**

The International Maritime Organization (IMO) is an organization of the United Nations and it is a major actor in international maritime safety regulation. The IMO has 166 member states, and its supreme governing body is the Assembly, which meets every two years. The Assembly selects a Council, which consists of 32 member states. The technical and legal work is carried out by five committees and by numerous sub-committees. (Stopford 2009)

The IMO Conventions include both preventive and sanction and consequence instruments. The implementation of IMO rules is based on the two different roles of a state: “flag state” and “coastal state”. In the role of a flag state, the state rules ships registered under its flag regardless of where the ship is in the world. The coastal state, also known as the port state, enforces maritime laws on ships that are in its territorial waters. (Stopford 2009) Currently, the IMO has a total 29 conventions (IMO 2010b).

The international regulation process in the IMO often is slow, and many times the result becomes a compromise of compromises. At the regional level, there would often be willingness to react more quickly to deficiencies in the maritime safety system. The IMO does not support regional decision-making, and regional systems are problematic from the point of view of the global shipping industry. Regional arrangements, such as the European Union maritime safety legislation or Particularly Sensitive Sea Area

(PSSA) systems of the IMO can be regarded as a failure of the international system to make comprehensive regulation in shipping industry (Goss 2008; Kaps 2004).

IMO legislation can mostly be considered reactive and technical - regulation is revised or made more stringent after major marine accidents and it focuses on technical details. This kind of “post accident” policy is often unsuccessful. Policy-making is not very comprehensive, and too much attention is focused on one particular risk (Goulielmos 2001; Karvonen et al. 2006; Knapp and Franses 2009).

At the international level, national representatives make up the IMO, devising maritime policies for a globalized industry from a national perspective. This often means promoting national, protectionist interests instead of maritime safety interests. (Roe 2008; Roe 2009) Another major problem is the implementation of regulation, which is the responsibility of the member states. Member states have very different standards of implementation. The failure of the flag-state control system to control ship conditions in a uniform way in all flag states has led to a situation where the real ship conditions are verified in several other ways: port state control systems, supervision performed by classification societies and vetting inspections. The various inspection systems do not recognize inspections performed by another regime. There does not seem to be significant differences between various inspections, which increase the workload on ships and add to the costs. (Knapp and Franses 2007)

The system also allows the existence of flags of convenience and the operations of obscure and indifferent shipping companies. For example in the case of the Erika tanker accident in 1999, it turned out that: “*the owners were a Maltese company under the control of two Liberian companies, the capital of which was held by individual or legal entities whom it has not been able to identify with absolute certainty*” (Permanent Commission of Enquiry into Accidents at Sea 2000, 8). In addition, there were 11 other parties involved in the transportation on a primary or secondary basis (ship manager, crewing agency, time charterer, maritime agent, P&I Club etc.) These complex arrangements resulted in a situation where it was very difficult to determine what the responsibilities of each party were. (Permanent Commission of Enquiry into Accidents at Sea 2000)

### **5.1.2 The human factor and safety management**

The human factor has been identified as the most important cause of maritime accidents (e.g. Kujala et al. 2009; Trucco et al. 2008), and in nearly all shipping accidents, the human factor plays some role. Technological development has led to a reduction in the number of technological failures, which in turn has revealed the underlying level of influence of human error in accident causation (Hetherington et al. 2006). Economic pressures in a strongly competitive industry have also added to the human factor causing shipping accidents (Trucco et al. 2008).

If the human factor is the major cause of accidents, effective policies should examine how the effect of the human factor in accident causes could be diminished. Safety

management, including inspection and training, are commonly thought to be the key means of tackling the human factor contribution to accidents (Trucco et al. 2008). Working conditions, safety culture on board, and proper use of technological and other tools are also perceived to have a role in preventing accidents caused by the human factor (Karvonen et al. 2006).

Errors related to the human factor can be of two kinds: active and latent errors. Active errors are ones made by the pilot, control room crew, ship officers or other operators. The biggest threat to safety comes from latent errors, however, which are caused by poor design, incorrect installation, faulty maintenance, poor management decisions etc. An active error made by the operator is just the finishing touch on the human factor based error leading to a casualty (Hänninen 2008). According to Hetherington et al. (2006), the fundamental error inducing character in shipping lies in the social organization, economic pressure and the structure of industry. Hänninen (2007) points out in his study on the Estonia accident that the safety culture of the shipping industry is in many ways old-fashioned. For example, there is a high tolerance for incidents and near misses in the maritime community.

### 5.1.3 Third party involvement

Third parties, both public and private ones (financial firms, insurers, government agencies, auditors, consultants etc.) have the power to influence the behaviour of companies. They can implement incentives or sanctions affecting other parties, from the making or breaking of social and economic relationships to concrete financial penalties formalized in legally binding contracts. Still, third parties are rarely utilized in the promotion of public interests. In maritime regulation, third party actors, such as associations of shipowners, cargo owners, shippers, insurers, classification societies and banks, have potential to exert an influence over ship safety and environmental standards. (Bennett 2000)

All shipping companies are not the same. There are companies that have a policy of *“buying second-hand ships cheaply, operating them cheaply, skimping on safety measures and, when prospective repairs become expensive, abandoning them, and their unpaid crews, in some obscure port from which the owners cannot easily be traced”* or a policy of *“being very good indeed at every aspect of shipping, being willing to experiment selectively with new technologies (without always being the pioneer), acting as good employers, achieving a high reputation with consumers and thus making good profits most of the time”* (Goss 2008, 143). The problem is that good and bad companies are competing in the same market (Goss 2008). If a shipper required from a transporter a high safety level instead of solely looking at the price of transportation, obscure firms would not be able to operate in the market anymore.

#### **5.1.4 Effectiveness of the maritime safety policy system**

Most maritime safety policy instruments can be considered suitable for their purposes. They address matters directly connected to the operational circumstances of a ship and their improvement is likely to have an impact on the safety of shipping. One of the problems is that international legislation seems to lack the capability to take local circumstances into consideration and to provide fast responses when needed. Another problem is that it seems difficult to find effective policies to tackle the human factor, even if it has been identified as the main cause of the majority of accidents at sea.

A good policy instrument must be accepted by the stakeholders and the community. When looking at the society in a wider sense, it seems that it would be willing and ready to adopt more stringent policies on maritime safety, but these are not accepted by the industry, or they go against the principles of maritime law. For example, it has on many instances been proposed that the VTS system should be extended to cover the entire Baltic Sea area but, at the moment, this is not possible due to international legislation not allowing coastal states to employ the VTS system in high sea zones (e.g. Karvonen et al. 2006).

In order to be effective, the policy instrument must be implemented properly. This seems to be the core problem of the current system. International regulations based on nation-state implementation are not functioning properly. On the global scale, the differences in the ways of implementing maritime safety regulations are excessive. The existence of flags of convenience is the most visible sign of this. Differences in implementation lead to the other problems of the shipping industry. For example, it enables the operation of indifferent and obscure shipping companies.

A good policy instrument also encourages experimentation and gives incentives for improvement. The maritime safety policy is, in many aspects, very detailed, for example with regard to ship construction and equipment. The more detailed the legislation is, the less there is room for experimentation and innovations. Goal-based standards of ships (see Chapter 3.1) can be regarded as an attempt to leave more room for innovations in ship construction, as long as certain requirements are met. Another example, the ISM Code, includes the requirements of continuous improvement, but as Lappalainen (2008) points out, the shipping industry often lacks the kind of culture that aims at a continuous improvement of the safety culture.

The current maritime safety policy system is effective in many respects, but its greatest weaknesses are implementation and the failure of the system to work on the role of the human factor as a cause of accidents. Implementation based on nation state authorities has not succeeded on a global scale. The system allows sub-standard shipping in many respects: the implementation of international legislation has not succeeded, other companies and actors agree to co-operate with obscure shipping companies, and the consequences of sub-standard shipping are not severe enough. The savings resulting from sub-standard operation of ships have been considered to outweigh the penalties in the event that the owners and operators are caught (Mitroussi 2004).

## **5.2 Main conclusions of the questionnaire study**

In this Chapter, we will draw conclusions from the questionnaire study on a general level, focusing on the issues brought up by the literature analysis. As many of those issues were not taken up as such in the questionnaire, this Chapter partly depends on the views that were expressed in freely worded comments.

The general conclusion is that the results of the questionnaire study support the findings of the literature study. The current command-and-control maritime safety policy system can no longer efficiently solve maritime safety problems. Activities should be directed to support shipping companies and other actors in ensuring that their working environment supports safe and responsible operation, which is probably the most effective way to affect the human factor related risks. Below, the same three aspects that were taken up in Chapter 5.1 of the questionnaire study results are analysed: international maritime safety regulation, the human factor and third party involvement.

### **5.2.1 Maritime safety regulation overview**

It seems that different kinds of maritime safety instruments dealing with both internal and external issues of a ship's safety are needed to ensure maritime safety. However, many comments stressed the fact that in the future, regulations should be developed instead of augmenting their number. The existing regulations are enough and cover all the necessary issues, but regulations are not followed, they are not implemented properly, or the contents of regulations do not match the purposes of the regulation in question.

The questionnaire did not deal with the actors of maritime safety legislation, but some comments stated that the International Maritime Organization should be the primary actor in maritime safety. European Union maritime safety legislation is a problem, because shipping is an international business and the EU legislation adds to the complexity of maritime safety regulation, while on the other hand, the European Union can provide faster responses to safety risks than the IMO, which erodes the authority of the IMO.

The questionnaire results imply that maritime safety regulation focuses too much on technical and structural questions. The needs for or benefits of technical changes are often not studied properly in advance. Neither can technology make up for the human effect in safe shipping. If we trust technology too much, it can become a safety risk in itself. For example, if the technology in use is too complicated, seafarers may lack the competence to use it properly, or if the technology fails, ships are no longer able to sail safely. Another important issue is ensuring the compatibility and transmission of information between different technical devices.

Too often, the implementation of maritime safety regulation includes only checking if the minimum requirements are met. Minimum repairs only are made on ships, even if

the whole equipment needed renovation. As one respondent put it, “despite of all the inspections, with some of the ships that you see at sea, it is difficult to believe that they meet all the requirements” (*freely translated*). Legislation and the work of authorities should be increasingly developed towards guidance and support, and more information should be available for example about the best practice cases or about near misses in the industry. Current legislation and the work of authorities depends too much on command-and-control type of policies.

The amount of paperwork and bureaucracy related to maritime safety regulation was often deemed to be too extensive. Officers should be able to concentrate on navigation instead of paperwork. In some comments, it was even suggested that there should be double manning onboard: one officer to take care of paperwork and administration, while the other is in charge of navigation.

### **5.2.2 Dealing with the human factor**

Human factor related issues stood out clearly in the questionnaire results: as the most significant way of enhancing maritime safety in the future was regarded spontaneous activity of shipping companies. Other human factor related issues (competence, manning of ships, working conditions) also ranked high in this respect. Human factor related risks (e.g. fatigue and competence) were seen as the most remarkable risks to maritime safety in the Gulf of Finland. At the core of these problems was seen the economic pressures of the shipping industry, which force many shipping companies to operate ships as cheaply as possible.

In the freely worded comments, the respondents also emphasized the fact that maritime safety is to a large extent dependent on what is going on in the minds of seafarers. Formal regulation can only have a limited effect on that issue. One important factor is social relationships onboard. It is of crucial importance that seafarers are fit and motivated and committed to their jobs and that their working environment supports safety, which in turn supports good social relationships and communication onboard.

Good communication between the shore-based organization and the ships in a shipping company is also highly important. Activities of shipping companies in safety issues are an effective way to improve safety if carried out right. It has too often only meant one more checklist or one more file in the bookshelf. Adequate resources should be allocated to safety, and the focus should be on practical co-operation.

Co-operation between the VTS centres, pilots, authorities and ship's officers was an issue that was also brought up. Functional cooperation would add to maritime safety, but it requires trust between the various actors, and it seems that at the moment, this trust is not there, for example seafarers doubt the competence of VTS operators. The competence, knowledge and motivation of people who are either involved in the maritime safety regulation processes or in implementation was a concern that was expressed often. The basis of safe operation at sea is to understand the operations of a ship and the external factors that are affecting it.

The conclusion concerning the human factor is that regulatory policies can only have a limited contribution in human factor issues. The activities of shipping companies are more crucial: do they allocate enough resources to personnel and safety, do they support a safe working environment on ships, is the personnel motivated and committed to their jobs etc. In the future, more emphasis should be put on these issues, instead of just issuing new technical regulations. The maritime authorities should also focus more on how they can support safety in the shipping industry by other means than just checking if the minimum requirements are fulfilled. This could include spreading the word about best practices or by adding to co-operation and information sharing between shipping companies and other actors dealing with maritime safety.

### **5.2.3 The role of third parties in maritime safety**

Some comments in the questionnaire underlined the importance of third parties in the promotion of maritime safety. It was suggested that cargo owners should have a greater liability, as this would increase their interest in the ships they are using for transportation. It was also suggested that shipping companies should have a greater liability, as this would increase the interest of marine insurers in the safety standard of their clients. It also remains the principle of maritime law that culpability and sanctions are in many cases targeted at crew members, when they should rather target cargo owners, management of shipping companies and the whole transport chain, in other words those who are responsible for the transportation of cargo and for the ship and its conditions. Only in the cases of intent and intentional negligence should sanctions be primarily targeted at crew members.

## 6 CONCLUSIONS

Various kinds of policy instruments aim at the reduction of accidents at sea and other harmful effects of shipping. The amount of maritime safety regulation is extensive, ranging from international legislation to supra-national, regional and national level. In the Gulf of Finland, an increasing amount of traffic and the large share of oil in maritime transports has given rise to extensive concern about the possibility of a major oil accident. Several measures have been adopted and new measures are continuously being developed and proposed to prevent an oil accident. Although the goals are good, there is a risk of the shipping industry becoming encumbered with excessive rules and extra costs, which in the end will do little to decrease accident risks. The purpose of this report has been to find out what the major causes of safety risks and the most effective policy instruments to decrease those risks are.

On the basis of questionnaire responses, maritime safety policy instruments can be divided into several groups according to their effectiveness and development needs (see Figure 6.1). The largest development needs and future potential to improve the maritime safety standard are regulations on competence, working and employment conditions of seafarers, manning of ships, piloting and fairway and port dues. Policy instruments that have been effective in the past and which still have future potential to improve the maritime safety level include control of ship conditions, ISM Code, VTS operations, traffic separation schemes and routing, economic incentives, information about safe shipping and the spontaneous activity of shipping companies, which was ranked as the most effective way to enhance maritime safety in the future.

Issues which are crucial for safe shipping but which do not have so much development potential include ship construction and equipment, fairway safety, nautical charts and information about navigation conditions. In other words, the current situation was perceived to be comparatively satisfactory. Development needs mostly concentrate on transmitting real-time data and synchronizing information between different technical devices.

Marine insurance, P&I clubs or ship reporting systems (GOFREP) did not seem to have much potential in promotion of maritime safety according to the respondents. The GOFREP system was criticized for adding to the workload on the bridge and giving nothing in exchange for a ship.

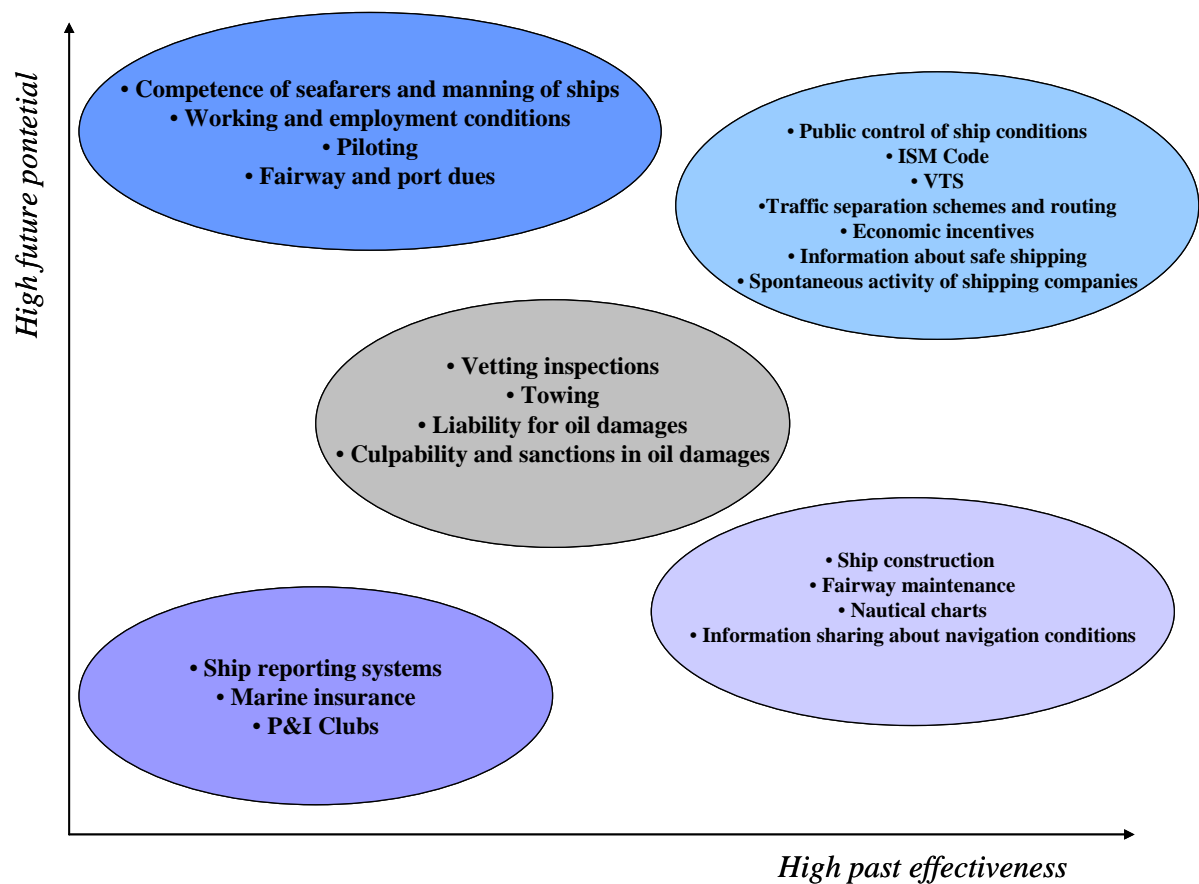


Figure 6.1. The grouping of policies according to their past effectiveness and future potential

VTS operations and piloting elicited many opinions. They also were mentioned the most frequently as ways to prevent an oil accident in the Gulf of Finland (the development of VTS and piloting). Many respondents were of the opinion that the VTS should have more authority to control maritime traffic. Incorporation of piloting was criticized for the fact that economical thinking has outweighed safety. Part of the respondents supported allowing the English pilot on-line service, part of them objected to it, because they thought it would undermine safety.

The high number of ship inspections that are performed in the maritime industry were dealt with in several questions. The results indicate that there are too many overlapping inspections. Co-ordination between different inspection systems should be increased, ensuring that the same ships are not inspected about the same issues too often (especially ships that have passed the inspections without major problems); in other words, the inspections should be better targeted at risky vessels. Inspections require resources and add to the workload. Inspections should focus on relevant, major safety issues instead of just checking details that are irrelevant from the comprehensive safety point of view.

Overall, the results imply that if we wish to improve maritime safety, the primary focus should be on the human factor. Technology, although important in itself, cannot make

up for the human factor in safety matters. Spontaneous activities of the shipping companies ranked as the most effective way to improve maritime safety in the future, and human factor connected risks (such as fatigue, competence or safety culture) ranked as the greatest risks for maritime safety in the Gulf of Finland. Measures related to the human factor were mentioned third most often as ways to prevent an oil accident in the Gulf of Finland. The shore-based organization of a shipping company and other actors in the shipping industry and transportation chain also have a remarkable role in maritime safety.

A prerequisite for safe shipping is competent and committed employees, and these cannot be replaced by technical solutions, no matter how sophisticated they might be. To ensure the competence of employees in all shipping industry related jobs, the maritime education system must be of a good quality, and seafaring occupations must be attractive to young people. It is important that there is further training possibilities, which for example train seafarers in the use of new devices and give them qualifications for shore-based maritime jobs, and that shore-based jobs are attractive to experienced seafarers considering pay, employment conditions, work content, and other relevant matters. Competent and motivated maritime employees will be a prerequisite for safe shipping also in the future. Functional co-operation between ships, shipping companies, pilots, VTS operators and authorities does add to maritime safety, but it requires trust between the different actors. It seems that this trust is not always there and that actors doubt the competence and motivation of other actors.

In majority of the questions about the effectiveness of past regulations/practices and about the future potential of regulation/practices to improve maritime safety, the share of “I agree strongly” or “I agree partly” answers was over 50%. This indicates that maritime safety regulation or other risk control options are needed to ensure safe maritime traffic and that they have improved maritime safety. However, in the future the focus should be on the development of existing instruments and their implementation, not on augmenting the amount of maritime safety regulation. Instead of command-and-control policies, maritime safety regulation should increasingly develop towards supporting and encouraging shipping companies to operate responsibly. In addition, responsibility for maritime safety also belongs to other actors in the maritime industry and transport chain, such as shippers, classification societies or marine insurers. It would also be beneficial for safety if different actors worked more openly and information about best practices and weak points were disseminated better in the maritime industry.

Many of the maritime safety risks stem from economic pressures of the shipping industry, and these cannot be efficiently solved by maritime safety regulations. Resolving them would rather require changes in the governance of the shipping industry, for example making the operation of irresponsible shipping companies impossible and enabling the legislation processes in the IMO to react to safety risks fast and effectively.

## **6.1 Further research**

In connection with the SAFGOF research project (see Chapter 1.1), the results of the questionnaire will be used to develop risk control options, which will be included in the SAFGOF meta-model. The meta-model will combine future traffic scenarios, oil accident probability models (developed in the SAFGOF project by Aalto University) and environmental risk models of an oil accident in the Gulf of Finland (developed by Helsinki University) and the selected risk control options. The meta-model can be used as a decision model to test the effect of various risk control options on the risks of an oil accident, making it possible to rank different risk control options on the basis of their effect on the accident probabilities or the harmful consequences of an oil accident.

In the questionnaire, the development of VTS operations and piloting were named as the most effective ways to prevent an oil accident in the Gulf of Finland. In the first phase, the risk control options that are included in the SAFGOF meta-model will be formulated around these themes. Besides including them in the meta-model, a qualitative analysis of the selected risk control options will also be performed on the basis of evaluation criteria that were presented in Kuronen & Tapaninen (2009) or (2010).

Additionally, a new, triennial research project “Competitive Advantage by Safety” (CAFE) will begin at the end of 2010. The Centre for Maritime Studies is one of the partners in the project. This project will develop further the maritime safety themes that were dealt with in the SAFGOF and METKU (Development of maritime safety culture) projects. In the CAFE project, the CMS will develop such as a conceptual model of the effect of safety management on the safety level and analyze the concept of corporate social responsibility in connection with the shipping industry.

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## APPENDICES

### APPENDIX 1

#### QUESTIONNAIRE<sup>2</sup>

##### Background information

- 1) Which of the following sectors are you working in at the moment? [*this question was only included in the Internet questionnaire*]
  - VTS service
  - Piloting
  - Seafarer
  - On-shore employee of a shipping company
  - Maritime or traffic administration
  - Maritime or traffic education or research
  - Other, what?
  
- 2) Have you worked as a seafarer (e.g. deck officer, crew, engine room). If yes, for how long?
  - less than a year
  - 1-5 years
  - 5-10 years
  - 10-15 years
  - over 15 years
  - I have not been working as a seafarer
  
- 3) If you answered the previous question “I have not been working as a seafarer”, how long is your other experience in shipping?
  - less than a year
  - 1-5 years
  - 5-10 years
  - 10-15 years
  - over 15 years
  
- 4) How did you find about this questionnaire? [*this question was only included in the Internet questionnaire*]
  - I got the information in a maritime event, e.g. in a conference
  - I got the information from my trade union
  - My colleague told me
  - Through the website of the Kotka Maritime Research Centre or the Centre for Maritime Studies
  - Some other way, what?

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<sup>2</sup> Translated from Finnish

In the following questions, preventive ways to minimize the risks of maritime accidents are presented. Evaluate their effectiveness in preventing accidents at sea, especially from the point of view of sea areas near Finland.

*All the following questions had two parts:*

Operative regulations/practices have improved the maritime safety remarkably

- I disagree strongly
- I disagree partly
- No opinion
- I agree partly
- I agree strongly

By developing regulations/practices further, maritime safety level could be enhanced remarkably

- I disagree strongly
- I disagree partly
- No opinion
- I agree partly
- I agree strongly

Questions:

- 5) Ship structure and equipment (e.g. SOLAS)
- 6) Public control of ship conditions (e.g. flag state control, port state control, host state control)
- 7) Vetting inspections
- 8) Competence requirements of seafarers and manning of ships
- 9) Employment and working conditions of seafarers
- 10) ISM Code (safety management system)
- 11) Vessel Traffic Services (VTS)
- 12) Ship reporting systems (e.g. GOFREP)
- 13) Traffic separation schemes and routing
- 14) Piloting
- 15) Towage (in the vicinity of ports or emergency towing)

- 16) Fairway marking and safety devices
- 17) Nautical charts
- 18) Information sharing about weather, ice conditions, water level etc.
- 19) Fairway and port dues
- 20) Marine insurance
- 21) P&I Clubs
- 22) Liability for oil damages (IMO Conventions – CLC, FUND)
- 23) Culpability and sanctions in oil damages
- 24) Economic incentives, e.g. investment support
- 25) Information about safe shipping, e.g. on-line services or IMO recommendations
- 26) Spontaneous activities of companies (e.g. shipping companies) to improve safety

In addition, under each question the respondents were given an opportunity to write freely worded comments on the regulation or practice in question.

27) The growing amount of oil transports in the Gulf of Finland have given rise to concerns about the possibility of a major oil accident. Do you think that

- a) more actions are needed to prevent the accident. Please elaborate \_\_\_\_\_
- b) all effective actions have been taken.
- c) too many actions have been taken to prevent an oil accident. Please elaborate \_\_\_\_\_
- d) no opinion

28) Ship conditions are supervised by means of several inspection systems, e.g. flag state and port state control, vetting inspections etc. Do you think that

- a) all inspections are effective and they are needed to ensure safety.
- b) not all inspections are effective or necessary to enhance maritime safety. Please elaborate \_\_\_\_\_
- c) inspections could be effective but their contents and practices should be developed. Please elaborate \_\_\_\_\_
- d) no opinion

29) Below is a list of the possible risk factors for maritime safety. Evaluate their significance especially from the point of view of the Gulf of Finland/other local sea areas at the moment.

	not significant at all	significant to some extent	no opinion	quite significant	very significant
Deteriorated ships					
Growth of ship size					
Inadequate competence of seafarers					
Fatigue of seafarers					
Low level of safety culture on ships					
Low level of safety culture in shipping companies					
Complexity of maritime safety legislation					
Amount of bureaucracy in shipping					
Unsatisfactory activity of maritime safety administration					
Competence problems in VTS operations					
Congestions in fairways					
Transports of oil and other dangerous substances by sea					
Problems in traffic management, e.g. unclear lane distributions					
Disregard of fairway rules					
Use of pilot is not obligatory in all circumstances which would require the use of pilot					
Waterway safety devices are not functioning properly or they are placed poorly					
Errors in nautical charts or charts lack necessary information					
Relevant information about weather and similar is not available or it is not in an easy-to-use form					
Marine insurers do not check the conditions on ships they are insuring					
In cases of accidents, the financial and juridical consequences for the shipping company are not severe enough					

30) Do you think that there are other relevant risk factors for the safety of maritime traffic in the Gulf of Finland/other local sea areas than listed above? (open-ended question)

31) Other comments on the contents of this questionnaire? (open-ended question)

32) If you wish to receive information about the results of this study by e-mail, please enter your name and e-mail address here.

## APPENDIX 2

### KYSELY

#### Taustatiedot

- 1) Millä seuraavista sektoreista työskentelet? *[tämä kysymys vain Internet-kyselyssä]*
  - Alusliikennepalvelu (VTS)
  - Luotsaus
  - Merenkulkija
  - Varustamot; muu henkilöstö
  - Merenkulku- tai liikennehallinto
  - Merenkulku- tai liikennealan koulutus ja tutkimus
  - Muu, mikä?
  
- 2) Onko sinulla kokemusta merenkulkutyöstä aluksilla (esim. päällystö, miehistö, konehuone)? Jos on, niin kuinka monen vuoden ajalta?
  - alle yksi vuosi
  - 1-5 vuotta
  - 5-10 vuotta
  - 10-15 vuotta
  - yli 15 vuotta
  - ei ole kokemusta
  
- 3) Jos vastasit edelliseen kysymykseen “ei ole kokemusta”, niin kuinka kauan olet muutoin työskennellyt merenkulkuun liittyvien asioiden parissa?
  - alle yksi vuosi
  - 1-5 vuotta
  - 5-10 vuotta
  - 10-15 vuotta
  - yli 15 vuotta
  
- 4) Mistä sait tiedon tästä kyselystä? *[tämä kysymys vain Internet-kyselyssä]*
  - Sain tiedon kyselystä alan tilaisuudessa
  - Sain tiedon kyselystä ammattiliiton kautta
  - Sain tiedon kyselystä kollegaltani
  - Sain tiedon kyselystä Merikotkan tai Merenkulkualan koulutus- ja tutkimuksen Internet-sivujen kautta
  - Muuta kautta, mitä?

Seuraavassa kysymyssarjassa on lueteltu keinoja, joilla vaikutetaan tai voitaisiin vaikuttaa merionnettomuusriskeihin ennaltaehkäisevästi. Arvioi niiden merkitystä merionnettomuuden ennalta ehkäisyssä erityisesti Suomen lähimerialueilla ottamalla

kantaa esitettyihin väittämiin. Jos et tunne kysyttyä asiaa, valitse vastausvaihtoehto ”en osaa sanoa”.

Kaikissa seuraavissa kysymyksissä on kaksi osaa:

A. Olemassa olevalla sääntelyllä/käytännöillä on parannettu meriturvallisuuden tasoa merkittävästi

- täysin eri mieltä
- osin eri mieltä
- en osaa sanoa
- osin samaa mieltä
- täysin samaa mieltä

B. Sääntelyn/käytäntöjen kehittämällä voitaisiin tulevaisuudessa parantaa meriturvallisuuden tasoa merkittävästi

- täysin eri mieltä
- osin eri mieltä
- en osaa sanoa
- osin samaa mieltä
- täysin samaa mieltä

Kysymykset:

5) Alusten rakennetta ja varusteita koskeva sääntely (esim. SOLAS)

6) Julkinen alusturvallisuuden valvonta (lippuvaltiotarkastukset, satamavaltiotarkastukset, isäntävaltiotarkastukset)

7) Yksityinen alusturvallisuuden valvonta (vetting tarkastukset)

8) Merenkulkijoiden pätevyysvaatimuksia ja alusten miehitystä koskeva sääntely

9) Merityötä tekevien työehtoja ja työskentelyolosuhteita koskeva sääntely

10) ISM-koodi eli turvallisuusjohtamisjärjestelmä

11) VTS-toiminta

12) Alusten ilmoittautumisjärjestelmät (esim. GOFREP)

13) Väylien käytön ohjaaminen (esim. alusten reititys, kaistajaot, erikoisväylät, liikennerajoitukset)

14) Luotsaus

15) Hinaus (satamiin johtavilla väylillä tai hätähinaus)

16) Väylien merkintä ja turvalaitteet

- 17) Merikartat
- 18) Olosuhdetietojen tarjonta merenkulkijoille (sää, vedenkorkeus, jääolosuhteet, jne.)
- 19) Väylä- ja satamamaksut
- 20) Merivakuutukset
- 21) P&I klubit
- 22) Öljyonnettomuuden korvausvastuut (IMO sopimukset, esim. CLC, FUND)
- 23) Öljyonnettomuuden syyllisyysvastuut ja rangaistukset
- 24) Taloudelliset kannustimet, esim. investointituet alusten rakennuttajille
- 25) Tiedotuksen lisääminen turvallisesta merenkulusta (esim. Internet-palvelut, kuten Baltice.org tai IMO:n suositukset)
- 26) Yritysten oma toiminta ja aktiivisuus turvallisuuden edistämässä (esim. vapaaehtoisten laatujärjestelmien käyttöönotto)

Vastaaajien oli lisäksi mahdollista kommentoida jokaista kysymystä vapaamuotoisesti.

27) Lisääntyneet öljykuljetukset ovat herättäneet huolta suuren öljyonnettomuuden mahdollisuudesta Suomenlahden ja Itämeren meriliikenteessä. Oletko sitä mieltä, että

- a) öljyonnettomuuden ehkäisemiseksi olisi ryhdyttävä tehokkaampiin toimenpiteisiin, tarkenna millaisiin toimenpiteisiin: \_\_\_\_\_

b) kaikki järkevät toimenpiteet öljyonnettomuuden ehkäisemiseksi on jo tehty.

c) öljyonnettomuuden ehkäisemiseksi on tehty jo liikaakin toimenpiteitä, perustelut:

\_\_\_\_\_

d) en osaa vastata

28) Kauppamerenkulussa toimivien alusten kuntoa valvotaan monilla tarkastusjärjestelmillä, esim. lippuvaltio-, satamavaltio-, luokituslaitos- tai vetting-tarkastuksilla. Oletko sitä mieltä, että

a) kaikki suoritettavat tarkastukset ovat tehokkaita ja tarpeellisia meriturvallisuuden edistämiseksi.

b) kaikki suoritettavat tarkastukset eivät ole tehokkaita tai tarpeellisia meriturvallisuuden edistämiseksi. Mistä tarkastuksista voitaisiin luopua kokonaan?

\_\_\_\_\_

c) tarkastukset voisivat olla tehokkaita meriturvallisuuden edistämässä, mutta niiden sisältöä ja menettelytapoja pitäisi kehittää. Määrittele, mikä tarkastusmuoto ja millaisia kehittämistarpeita siinä näet: \_\_\_\_\_

d) en osaa vastata

29) Seuraavassa on lueteltu mahdollisia riskitekijöitä meriturvallisuudelle. Arvioi niiden merkittävyyttä erityisesti Suomenlahden tai muiden Suomen lähimerialueiden meriturvallisuuden kannalta tällä hetkellä.

	ei lainkaan merkittävä	jonkin verran merkittävä	en osaa sanoa	melko merkittävä	merkittävä
alusten huono kunto					
alusten koon kasvu					
merimiesten heikko osaamistaso					
merimiesten väsymys					
huono turvallisuuskulttuuri aluksilla					
huono turvallisuuskulttuuri varustamoissa					
meriturvallisuuslainsäädännön monimutkaisuus					
byrokratian määrä aluksilla					
meriturvallisuushallinnon huono toimivuus					
VTS:n toimivaltaongelmat ruuhkat meriväylillä					
öljykuljetusten ja muiden vaarallisten aineiden kuljetusten suuri määrä					
liikenteen väylille jakautumiseen liittyvät ongelmat (esim. epäselvät kaistajaot)					
meriteiden sääntöjen noudattamatta jättäminen					
luotsin käyttö ei ole pakollista kaikilla vaikeasti navigoitavilla merialueilla tai muissa mahdollisesti luotsin käyttöä vaativissa tilanteissa					
väyliä turvalaitteet eivät toimi tai ne on merkitty huonosti					
merikartoissa on virheitä tai niistä puuttuu tarpeellisia tietoja					
merenkulkuolosuhteista (esim. sää) ei ole saatavissa tarpeeksi tietoa tai tietoa ei					

ole saatavissa sopivassa muodossa					
merivakuutusenantajat eivät varmista vakuuttamiensa alusten todellista kuntoa					
onnettomuustilanteissa varustamolle koituvat taloudelliset ja oikeudelliset seuraamukset eivät ole riittävän suuria ja vakavia					

30) Onko mielestä olemassa Suomenlahden tai muiden Suomen lähimerialueiden meriturvallisuuden näkökulmasta muita merkittäviä riskitekijöitä kuin edellä mainitut?

31) Muita kommenttejasi kyselyn sisältöön liittyen?

32) Jos haluat saada sähköpostitse tietoa tämän tutkimuksen tuloksista, kirjoita nimesi ja sähköpostiosoitteesi tähän.



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