State of the art report: Nautical information management

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Draft 3	17/03/10	Jeppesen	JP	Exec Sum	Draft exec summary
Draft 3.2	18/03/10	Several	JP, RMM	Section 4	Edit KMS and NHS detail, add Sec 6
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Version 1.1	25/03/10	Several	JP	Multiple	Credits, copyright, clean-up

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Executive summary

This report summarises research into the current state of the art of nautical information management for 3 North Sea region port states which are partners in Work Package 4 (WP4) of the Interreg IVB North Sea Region BLAST (Bringing Land and Sea Together) project.

BLAST is an Interreg IVB North Sea project involving 16 partners from 6 countries, including government organisations, universities and private companies. BLAST will demonstrate improvements in maritime safety, economy, and environmental management that can result from trans-national harmonisation of land and sea data. There are 6 Work Packages in all. For more detail on BLAST, please go to http://www.blast-project.eu/.

BLAST WP4 involves 6 activities. Four of the activities were defined by Jeppesen GmbH:

1. State of the Art for Nautical Information (Research)
2. Maritime Data Collection System (Web Demonstration)
3. Harmonisation of Nautical Information (Nautical publications content structuring)
4. Digital Mariners' Routeing Guide (Web Demonstration)

These 4 activities include Jeppesen , Mälardalen University, the Norwegian Hydrographic Service, and Coastal Administration, Port of Stavanger, the Danish Hydrographic Service and Maritime Safety Administration, Port of Hirtshals (Hjørring Municipality), the German Hydrographic Service and Water and Shipping Administration Wilhelmshaven, and Port of Wilhelmshaven.

Mälardalen University and Jeppesen GmbH defined the research method. Research started in October 2009. It consisted of mariner surveys, interviews and site visits with coastal authorities, hydrographic offices, and port authorities, and literature review. Emphasis was placed on understanding how information is collected and organised by shore-based organisations. A research review and workshop was held in February 2010 to validate results and to identify which improvements in nautical information management should be explored in the demos.

The research found considerable variation in methods and organisations involved in collecting and processing maritime information in the 3 port states. Generally, coastal administrations, VTS centres, coast radio, and MRCC organisations have a major role collecting the information. Processing and publishing nautical information tends to be centralised within the coastal administrations and hydrographic offices. All 3 subject ports also maintain websites. Generally, interviewees felt that maritime information collection works well today, but ideas for improvements to test in the MDCS project were:

- Harmonisation of forms used to collect information

- Simplification of reporting processes (more user-friendly web UI)

- Ability to mark-up charts and publications online when reporting changes and defects

- Improved method of collecting detail on planned activities (construction, dredging, etc.)

- "Switchboard" function, enabling administrators to monitor and impact information flow

Preface

The BLAST (Bringing Land and Sea Together) project

BLAST is an Interreg IVB North Sea project promoting maritime safety in the North Sea region. It involves 16 partners from 6 countries, including government organisations, universities and private companies. The BLAST partners are collaborating to demonstrate the potential for improvements in maritime safety, economy, and environmental management that can result from trans-national harmonisation and integration of land and sea data. BLAST is divided into 6 Work Packages and a variety of projects from late 2009 through 2012. The BLAST Website summarises BLAST and gives detail on its work packages - http://www.blast-project.eu/.

BLAST Work Package 4: Navigating the North Sea

The projects conducted by Jeppesen GmbH and partners examine the collection, processing, and publishing of nautical information. The Jeppesen projects start with primary research to identify the current state of the art Denmark, Germany, and Norway. This enables the partners to identify what works well today and where there trans-nationally harmonised data could make it easier for the North Sea community to maintain a clear, current view of maritime conditions.

Project 1: Survey current state of the art

This report summarises research into the current state of the art in nautical information management systems in 3 North Sea ports. The research relates to 3 projects in BLAST Work Package 4 conducted by Jeppesen GmbH, Mälardalen University, the Hydrographic Offices of Norway, Denmark, and Germany, Coastal and Port Authorities in the 3 subject ports: Hirtshals, DK, Stavanger, NO, and Wilhelmshaven, DE.

Project 2: Port Data Collection System web demonstration

The Port Data Collection System (PDCS) project demonstrates a web-based solution prototype of trans-nationally harmonised maritime data collection, validation, and publishing. PDCS requirements definition starts in Phase 1. The PDCS web demo will be released late in 2010.

Project 3: Harmonisation of nautical information

This project will harmonise sections of core nautical information such as Notices to Mariners, Sailing Directions, etc. related to the 3 test ports. These publications are maintained by Hydrographic Offices and Coastal Authorities. North Sea Hydrographic Offices have a central role in the definition of the emerging IHO S-100 standards for nautical publications and charting. This project is a practical test of applying the IHO work. It runs from late 2010 to late 2011.

Project 4: Digital Mariners Routeing Guide web demonstration

The Digital Mariners Routeing Guide project aims to demonstrate the potential benefits of using trans-nationally harmonised data in products that can improve maritime efficiency and safety. Thus the North Sea DMRG builds upon what was learned in the prior projects. The 2008 Baltic Sea Digital Mariners' Routeing Guide and existing North Sea Routeing Guides will be referenced.

Introduction

Background

Sailing directions was the first of this kind of nautical information we have evidence of. In ancient times, sailing directions were largely unwritten, being conveyed by story or verse. Some early examples of written sailing directions are the panopli of the ancient Greeks. Among these the panoply Scylax of Caryandra is an often cited and remarkable example. Among the Scandinavian countries one of the first examples of sailing directions is from the end of the first millennium. The Vikings in their longships voyaged east to Russia and the Black Sea, along the western shores of Europe into the Mediterranean and even further, to Iceland, Greenland and Newfoundland. In the 11th century Icelandic saga *Landnåmabok* the sailing direction for Greenland is short and simple: "From Hernam (near Bergen) in Norway you must hold on to a due western course, and that will take you to Hvarf in Greenland. On your way you will come so close to the Shetland Islands that you can just see them in clear weather. And you will sail so far from the Faroe Islands that you will see half of the hills in the water. And you will be so close to Iceland that you will see whales and birds from there." (Pettersen, 1993) The reference says little about the vast undertaking of navigating the 1400-nautical-mile long journey from Norway to Greenland. Yet the information is to the point and useful even today, a thousand years later

Sailing directions and charts describe the physical appearance of the earth as reference points for position plotting and course setting. It is of course of vital interest that changing properties of the physical environment such as newly constructed or demolished cairns or beacons, drifting buoys and marks as well as missing features like newly discovered reefs are reported and inserted into sailing directions and charts as quickly as possible, before any accident occurs.

The Vikings did their journeys only in the summer time and their ships were small compared with today's standards. The size and time pressure on modern ocean transportation working day and night, all year around, makes huge demands on information management to be detailed and up to date.

Charts and sailing directions are still manually updated based on observation reaching the different hydrographic and coastal administrations from mariners and other reporters. These reports are delivered by radio, telephone or email. But in every country there may be several authorities that have the responsibility of updating nautical publications of different kinds. Often it can be difficult for the mariner to know to whom he should report a detected discrepancy. This activity of work pack 4 is targeting the issue of discrepancy reporting, aiming at developing a common tool for the whole North Sea. In this state of the art report the present process of receiving these reports in three North Sea countries, Denmark, Germany and Norway, is described.

Acronyms and Abbreviations

BfS	Bekanntmachungen für Seefahrer (Notices to Seafarers) - Germany
BSH	Bundesamt für Seeschifffahrt und Hydrographie
CCME	Central Command for Maritime Emergencies (Havariekommando) - Germany
COLREGs	Convention on the International Regulations for Preventing Collisions at Sea
COTS	Commercial Off-the-Shelf
DaMSA	Danish Maritime Safety Administration (see also FRV)
EfS	Notices to Mariners (Efterrettningar for Sjøfarande - Norway, or Efterretninger for Søfarende - Denmark)

DCA	Danish Coastal Authority (Kystdirektoratet)
ELWIS	Electronisches Wasserstraßen Informationssystem
ENC	Electronic Navigation Chart
FRV	Farvandsvæsenet (see also DaMSA)
GMDSS	Global Maritime Distress and Safety System
IHO	International Hydrographic Organisation
IMO	International Maritime Organisation
JRCC	Joint Rescue Coordination Centre
KMS	Kort & Matrikelstyrelsen (National Survey and Cadastre)
MARPOL	International Convention for the Prevention of Pollution from Ships
MAS	Maritime Assistance Service
MDCS	Maritime Data Collection System
MERAC	Maritime Emergency Reporting and Assessment Centre
MRCC	Maritime Rescue Coordination Centre
MRSC	Maritime Rescue Sub-Centre
MSI	Maritime Safety Information
NAVCO	Nasjonal koordinator for navigasjonsvarsler (National Coordinator for Navigational Warnings) - Norway
NCA	Norwegian Coastal Administration (Kystverket)
NfB	Nachrichten für die Binnenschifffahrt (Notices to Skippers)
NHS	Norwegian Hydrographic Service (Statens Kartverk Sjø)
NMD	Norwegian Maritime Directorate (Sjøfartsdirektoratet)
NSC-HO	National Survey and Cadastre - Hydrographic Office (Denmark - see also KMS)
NtM	Notice(s) to Mariners
SAR	Search and Rescue, or the International Convention on Maritime Search and Rescue
SOK	Søværnets Operative Kommando (Admiral Danish Fleet - Headquarters)
SOLAS	International Convention for the Safety of Life at Sea
VTS	Vessel Traffic Service
WSA	Water and Shipping Agency (Wasser- und Schifffahrtsamt)
WSD	Waterway and Shipping Directorate (Wasser- und Schifffahrtsdirektion)
WSV	Wasser- und Schifffahrtsverwaltung des Bundes

Method

The method used in the State of the Art research involved:

- Preparations with Core Partners

    o Jeppesen and Mälardalen reviewed BLAST and the objectives of the Work Package 4 projects with KMS, NHS, NCA, and BSH.

- Site Visits

    o Mälardalen conducted site visits in Norway, Denmark, and Germany

- Scripted Telephone Interviews

    o Jeppesen and Mälardalen prepared interview guides and conducted telephone interviews with Hydrographic Offices, Coastal and Port Authorities, and others.

- o Interview guides were refined as more was learned, generally.
  - o Follow-up on interview questions was conducted by email with partners
- Surveys
  - o An open-ended survey questionnaire was designed and conducted with ship bridge officers from the cruise industry.
  - o Portions of the survey were also investigated with cadets and officers attending Chalmers Institute.
- Meetings and email correspondence were used to validate findings.

Results

Overview

Section 4 summarises the results of the primary research and literature review for the three subject ports and port states involved in this study. Section 4 presents an overview of the organisations involved in maritime information management in each country, and then describes how information flows from the origin of new reports through publication of new information to the maritime community.

There was a rich discovery of information in this research activity, thanks to the BLAST partners. Some guidance on Section 4: It can be helpful to refer to the basic information flow diagrams for each country, found near the head of the "Findings" subsections. These subsections consider the flow of information in terms of 3 groups: Report Originators (shown in green in the diagrams), First-line Recipients (shown in yellow,) and Processors/Publishers. This is something of a generalisation, for the sake of order. In practice, the participants tell us that new information may originate within the port state organisations as well as from mariners.

These results accurately convey what was learned in the research; as is often the case, the research team continues to learn from feedback on the written report from the partners, and feedback from the maritime community on this report is highly encouraged.

Denmark

Organisations

In Denmark, management of nautical information at the government level is accomplished by several organisations. The BLAST primary research in Denmark identified the following organisations as having a critical role in nautical information management:

- Ministry of Transport
  - o The Danish Coastal Authority (DCA)
- The Ministry of Defence.
  - o The Danish Maritime Safety Administration, DaMSA)
- The Ministry of the Environment
  - o The National Survey and Cadastre (KMS)
- Selected survey port

o The Port of Hirtshals (Hjørring Municipality)

The Danish Coastal Authority

Kystdirektoratet (The Danish Coastal Authority, DCA) is a division of the Ministry of Transport. It is the state authority responsible for the construction and maintenance of coastal protection on the west coast of Jutland. Other responsibilities include harbour operation, dredging and storm surge alerts for the west coast of Jutland and the tidal flats.   DCA has been identified as an originator of information, but not investigated further.

The Danish Maritime Safety Administration

Figure 1 The head office of DaMSA in Copenhagen [photo Peter Dam, DaMSA]

Farvandsvæsenet (Danish Maritime Safety Administration, DaMSA) is an authority under the aegis of the Defence Ministry. DaMSA's five main tasks are: maritime information, buoying and navigation, official functions, piloting and coastal rescue. DaMSA's vision is that Danish waters are to be the world's safest place to sail.   Figure 2 shows the structure of DaMSA.
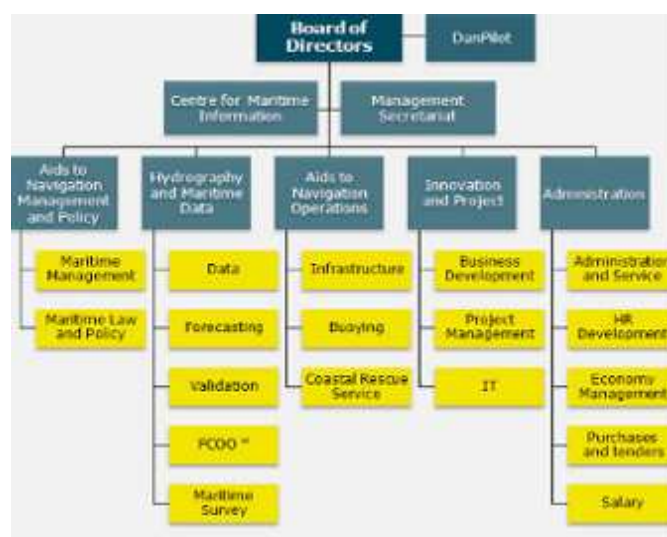
Figure 2 Diagram of the Danish Maritime Safety Administration's internal organisation [image DaMSA]

The Aids to Navigation Operations department (Drift og Beredskab – DB) is DaMSA's largest decentralised department. The department takes care of the operation and maintenance of lighthouses and buoys in Danish, Greenlandic and Faroese waters, radio navigation, nautical

surveillance and coastal rescue. The department is also involved in international cooperation with regards to buoying and radio navigation.
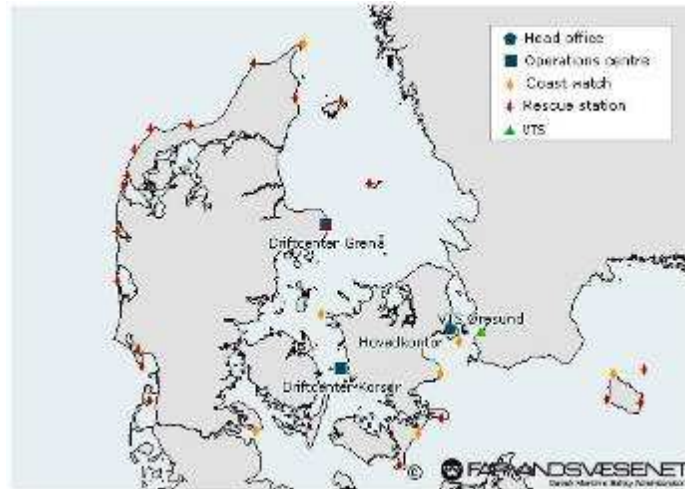

Figure 3 DaMSA units and centres in Denmark [image DaMSA].

Within the DB department a *Vagthavende Styrmand* (duty officer) is on watch during office hours. This is an officer with sea going experience that functions as the National Coordinator in Denmark. The duty officer answers the phone line/email for discrepancy reports. In the same office is also the *Nautisk OvervagningsFunktion* (NOF, literally "nautical monitoring function"). The NOF officer also serves as a "back watch" (stand-by) in his home, outside of office hours.

DaMSA is responsible for the publication of navigational warnings and a weekly printed and on-line version of *Efterretninger for Søfarende* (Notices to Mariners - NtM).

The National Survey and Cadastre, Hydrographic Office

Kort & Matrikelstyrelsen, KMS (National Survey and Cadastre, Hydrographic Office) is Denmark's public authority for maps and geodata, as well as the spatial infrastructure behind Denmark's growing e-Government. Once an office under DaMSA, the Hydrographic Office was moved to the National Survey and Cadastre in the 1980s, and brought with it the exclusive rights to produce official Danish nautical charts and to conduct nautical surveys. This latter responsibility is generally carried out by DaMSA under contract with the Hydrographic Office.

The Hydrographic Office produces nautical charts and publications that meet international conventions and specifications for safety at sea. In addition to nautical charts of Danish, Greenlandic and Faroese waters. KMS also produces a number of nautical publications, including web-based *Den danske Lods* (The Danish Pilot), *Danske Havnelods* (Danish Harbour Pilot Guides), *Behind the Nautical Chart* and *Kort 1/INT 1*, as well as the weekly *Chart Corrections.* The organisation of KMS with regard to maritime information is shown in Figure 4
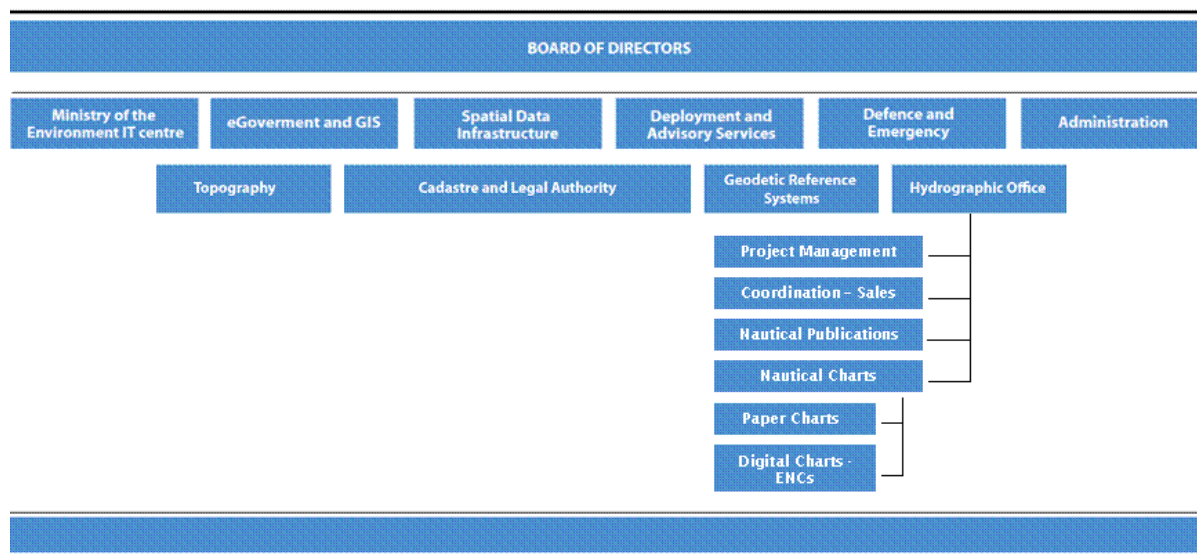
Figure 4 KMS Organisation Structure [image KMS]

Within the Hydrographic Office, four departments manage the technical, legal and administrative elements of developing, releasing and updating nautical charts and publications. Information on chart updates is derived from a number of sources, many of which are collated in the DaMSA's weekly *Notices to Mariners*, and are forwarded to the Nautical Charts section for integration into both paper and digital products. More general updates to be integrated into nautical publications are forwarded to the Nautical Publications section, which includes a number of specialised staff and editors.

Strategic and sector development initiatives, including contact to international regulatory bodies, are handled largely within the Project Management section, though additional employees from other sections are also engaged as points of contact and project leaders. Lastly, the Sales office maintains contact with the Hydrographic Office's commercial customers, including the administrative management of the contract with Primar for ENC distribution.

The responsibilities of the Danish Hydrographic Office are determined by Danish law.

The Danish Navy

Søværnets Operative Kommando (SOK - Admiral Danish Fleet Head Quarters) in Aarhus is the central command post for the Danish Navy. It is collocated with the Maritime Assistance Service (MAS) and the Joint Rescue Coordination Centre (JRCC). MAS is an integrated part of Admiral Danish Fleet functioning around the clock as a central maritime contact point for shipping in and around Danish territorial waters. The primary mission of MAS is to handle communication between the Danish coastal states, ship's captains requiring assistance, and other stakeholders in the world of shipping. These can be fleet owners, salvage companies, port authorities, brokers etc. JRCC is responsible for the coordination of all Search and Rescue (SAR) operations associated with aeronautical and maritime emergencies in Denmark There are also subordinated Maritime Rescue Coordination Centres MRCC in Denmark.

During non-office hours the MAS watch receives reports and issues navigational warnings on behalf of DaMSA.

SOK is also responsible for Storebælt Vessel Traffic Service (VTS) which is one of the two Danish VTS centres. (The other is "Sound VTS" in Oresund, between Sweden and Denmark, which is co-owned by DaMSA and the Swedish Maritime Administration as a pilot project.)

TDC Lyngby Radio

Lyngby Radio is part of a privately owned phone company TDC which runs the one remaining coastal radio station in Denmark. Lyngby Radio sends navigational warning every 4 hours, day and night, the whole year around on 2182 kHz and VHF Channel 16. Lyngby Radio also listens on Channel 16 and regional working channels and answers calls from the sea, notes and relays messages like discrepancy reports to the Duty Officer at DaMSA or SOK/MAS. In the Hirtshals area, the VHF working channel for Lyngby Radio is channel 66. The Port answers at VHF channel 12.

The Port of Hirtshals

The Port of Hirtshals is in Hjørring municipality in Region Nordjylland on the Northwest coast of Denmark. Hirtshals is an active commercial transport hub and fishing port with two ferry lines trafficking Norway daily, a large fishing fleet, and a cargo terminal.
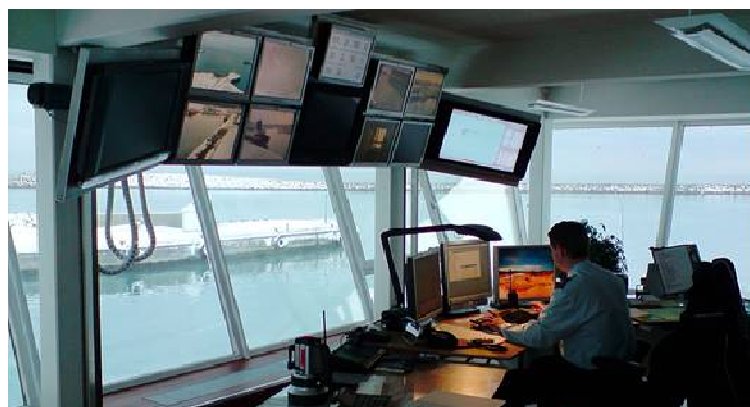
Figure 5 The Port of Hirtshals [photo Dr. Thomas Porathe].

Since 2001, Port of Hirtshals has been organised under a local Board of port stakeholders. Aids to Navigation outside the breakwaters are managed by DaMSA. Facilities and aids to navigation inside the breakwaters are managed by the port. The breakwaters and other coastal constructions are maintained by the Danish Coastal Authority. The port has its own pilot service and towing services. Tankers and ships under tow must have a pilot onboard.

Hirtshals is a good example of how shipping is managed on the North Sea coast of Denmark. Here, the Harbourmaster's Office performs the role of traffic management, takes first-hand reports from vessels of incidents and issues with published information, among a variety of other duties. The port control is manned by a watch officer 24/7/365 answering on VHF port channel 12 or the general channel 16.

Port of Hirtshals has recently started its Master Plan 2030, which includes:

- Reconstruction of ferry berths 1 and 2 to suit new high-speed ferries being deployed

- Deepening the East Basin to better serve the fishing trade

- Establishing a Customs Centre
- Reconstructions of road links to the East Basin

More information can be found on the ports own web: http://www.portofhirtshals.com

Interviews

Interviews in Denmark have included:

1) Interview with Chief Officer Mads Bentzen, Department of Aids to Navigation Operations, DaMSA

2) Interview with Michael Skov, Head of Aids to Navigation Management and Policy Division, DaMSA

3) Interview with Pelle Aagaard, Editor, Publication Section, Danish Hydrographic Office, Charting, KMS

4) Interview with Michael Langballe, Harbour Watch and Peter Ydesen, technical manager of Hirtshals Harbour

Findings

Figure 6 shows the information flow between the primary stakeholders involved in reporting changed and new nautical information, validating the input, and publishing the information.
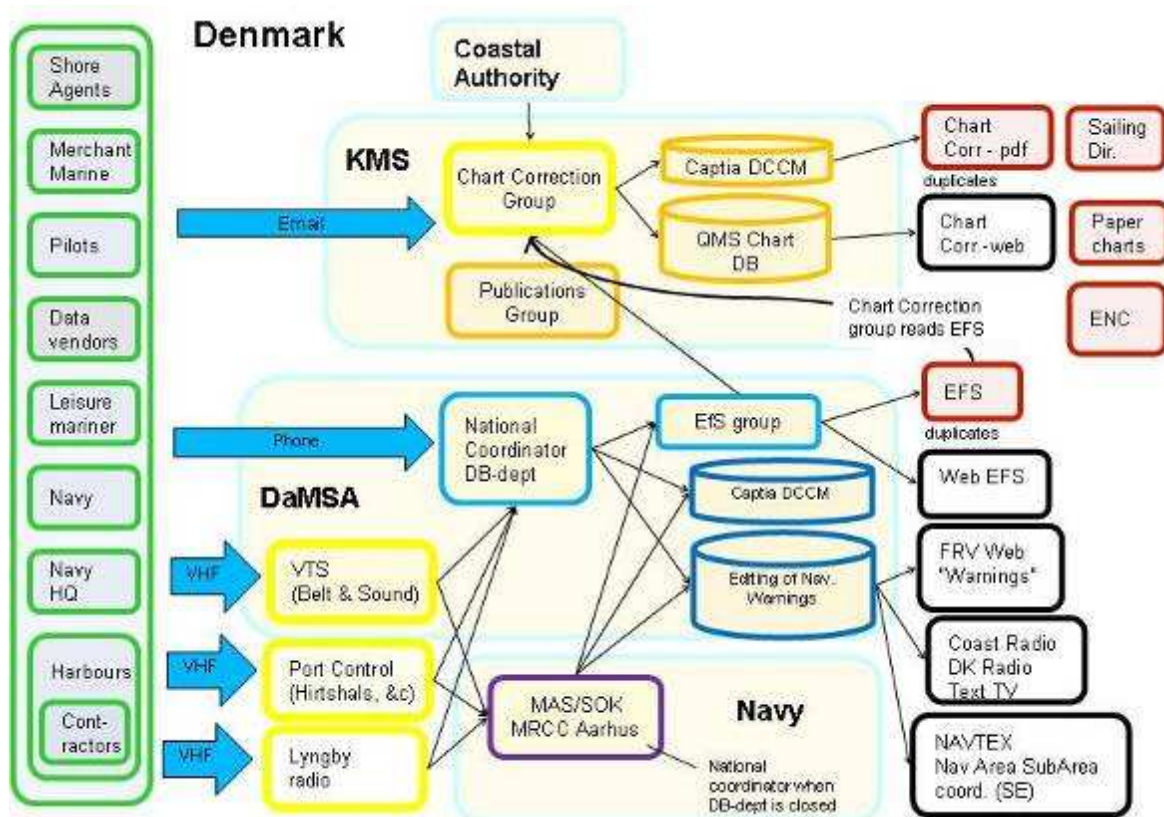
Figure 6 Flow of maritime information in Denmark

Report originators

The majority of the reports are from mariners or pilots that call in by VHF to Lyngby Radio, SOK/MAS watch in Aarhus, to one of the two VTS centres when in their areas.

Reporters also may phone directly to the Duty Officer at DaMSA or SOK/MAS.

Reports also can originate directly from the two Danish VTS centres in Storebælt or The Sound if there are any faults with the monitored buoys. If such a buoy is moved more than 50 meters it will send an alarm which then will be acted on. Lighthouses at sea will generate an automatic alarm to the DaMSA watch if there are any faults.

Summertime reports often come from the large number of leisure mariners sailing in Danish waters. They will report by VHF to Lyngby Radio or by mobile phone directly to DaMSA.

In the Port of Hirtshals, mariners, pilots and others submit reports to the Port Watch via VHF or telephone. Ports such as Hirtshals maintain a list of telephone contacts in DaMSA and forward reports about port conditions that they want this published in a navigational warning. Hirtshals Port Control also contacts SOK/MAS with urgent issues and after office hours.

Reports to DaMSA from coastal ports often come by email, but DaMSA urges them to phone to SOK/MAS because email is not read after office hours.

**Figure 7 A Danish language version of The Danish Harbour Pilot can be found on-line at
http://www.danskehavnelods.dk. In the contact section says that information about
faults and discrepancies are welcome, with email, and surface mail addresses. [KMS]**

First-line report receivers

When it comes to urgent matters concerning ship safety there is an on duty officer at the DaMSA who during office hours can be reached by phone through DaMSA switch board at (+45) 3268 9500 or direct at (+45) 3268 9591 or by mail at frv@frv.dk or direct at VagtS@frv.dk.

After office hours the first-line recipient of discrepancy reports is the joint navy and rescue centre in Aarhus (SOK/MAS). This is a command and control centre on watch 24/7/365. After office hours they will issue navigational warnings and if sea going resources are needed or they need advice, they will scramble the back watch, the NOF at DaMSA. The back watch can then either give advice or take over the lead.

The port control officer in Hirtshals sometimes gets reports from the sea that he forwards to the Duty Officer at DaMSA or SOK by phone. Reports are noted on plain paper.

Information from private individuals, leisure craft, ports etc., that call the SOK/MAS during office hours will be forwarded to DaMSA.

Processors and publishers of nautical information

DaMSA is responsible for issuing navigational warnings and is also responsible for most of the waterways and aids to navigation (some ports are responsible for buoys in their area).

Navigationsadvarsler (Navigational Warnings) are published by DaMSA on the web in both Danish and English (see Figure 8). Warnings are also read by Lyngby Radio every 4 hours day and night, and by Denmarks Radio every day at 1800 hours.

The Duty Officer can issue navigational warnings that are immediately published under Sailing Information > Warnings on www.frv.dk both in the Danish and in the English section of the web, and also published and broadcasted over the coastal radio, Denmark's public radio and NAVTEX (through the sub-area coordinator at the Swedish Maritime Administration). He can also dispatch sea going resources that can repair buoys or lights.

Figure 8 Navigational warnings published at DaMSA web. [DaMSA}

When a discrepancy report is received by the Duty Officer and the report is judged lo lead to a navigational warning, the report is typed into the electronic case and content management system Captia used to track and share reports (e.g. with the unit that needs to make the repair).

The navigational warning is then typed into a web based database called Redigering af Farvandsefterretninger (Editing of Navigational Warnings – see Figure 9).
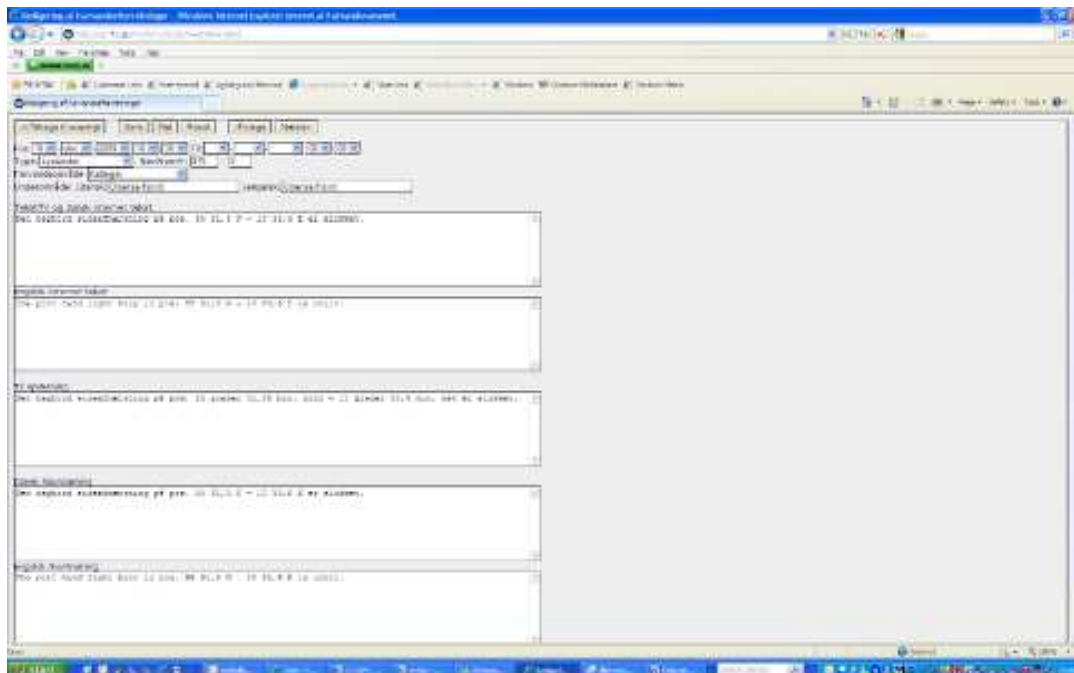
Figure 9 A screen shot from the web based editing system used by DaMSA (and SOK/MAS) to enter navigational warnings. [DaMSA]

The system publishes the warnings directly on the web and text TV in both Danish and English and sends scripts to be broadcasted by Lyngby and Denmark's Radio.

In Denmark, *Efterretninger for Søfarende* (Notices to Mariners – NtM, see Figure 10) is published by the coastal authority DaMSA as opposed to e.g. Norway where the NtM is published by the hydrographic office. In Denmark NtM is published once a week (on Friday) and the deadline for sending in updates is on Thursday. An early pre-edition of NtM is sent on to KMS and the editors of Chart Corrections. The printed version of NtM and Chart Correction are distributed together in a bundle. On the web they are published on DaMSA's and KMS' respective web sites, but there are links to the other publication on the respective page.

From the 1st of April 2010 the NSC-HO and DaMSA will no longer distribute Chart Corrections and Notices to Mariners in printed format. The publications will only be available on-line in web based and PDF versions.
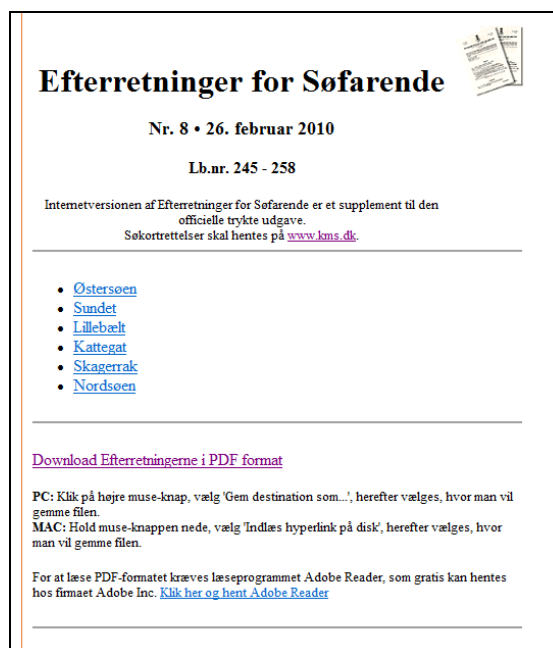
Figure 10 *Efterretninger for Søfarende* **(Notices to mariners - NtM) in the printed/pdf (left) and html version – both can be found on-line. [DaMSA]**
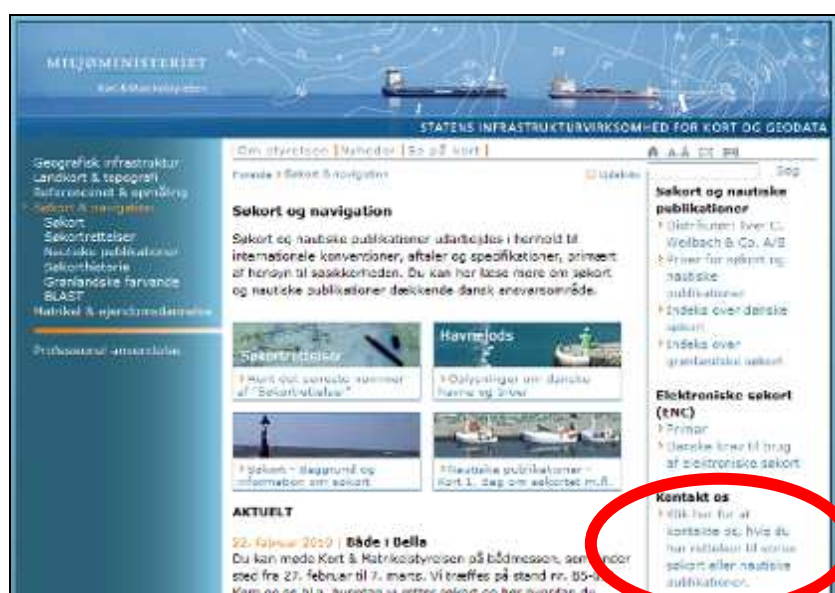
Figure 11 KMS has a link which opens an email addressed to soe@kms.dk on the Danish section of their webpage. The link reads "Click here to contact us if you have corrections for our charts and nautical publications". [KMS]

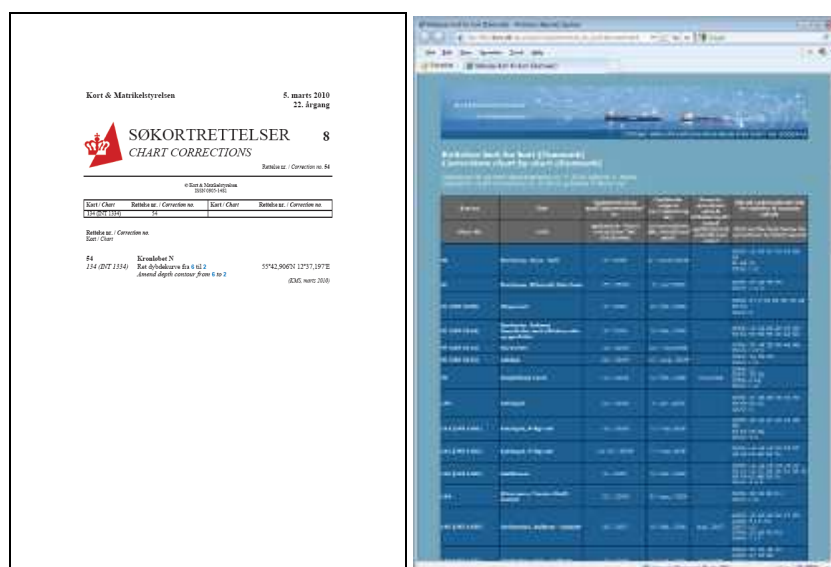**Figure 12 The Danish Harbour Pilot (in Danish) is produced by KMS and can be found on-line on http://www.danskehavnelods.dk [KMS]**

Figure 13 The printed and the web based version of Chart Corrections from KMS. Both can be found on-line. [KMS]

Germany

Organisations

In Germany, management of nautical information at the Federal and State (Länder) government levels is accomplished by a range of organisations. The BLAST research in Germany identified the following organisations as having a critical role in nautical information management:

- Federal Ministry of Transport, Building, and Urban Development (BMVBS)
    - Federal Maritime and Hydrographic Agency (BSH)
    - Central Command for Maritime Emergencies (CCME)
        - Maritime Emergency Reporting and Assessment Centre (MERAC)
    - German Maritime Search and Rescue Service (DGzRS) and MRCC Bremen
        - Regional Maritime Rescue Coordination Stations (MRCC)
    - 7 Waterways and Shipping Directorates (WSD)
        - 39 Waterways and Shipping Administration Offices (WSA)
            - Specifically the WSA Wilhelmshaven Office, in this case
            - Vessel Traffic Services (VTS Wilhelmshaven)
            - Seewarndienst Emden (MSI Emden)
- Selected survey port
    - Port of Wilhelmshaven
- German Pilots Association
    - Jade Pilot Association

Other groups, such as the German Water Police and the Navy, the German Pilots Associations, Port Authorities, and a range of private organisations from towing services to yacht clubs play a role in the identification of important changes and new needs for nautical information in German waters.
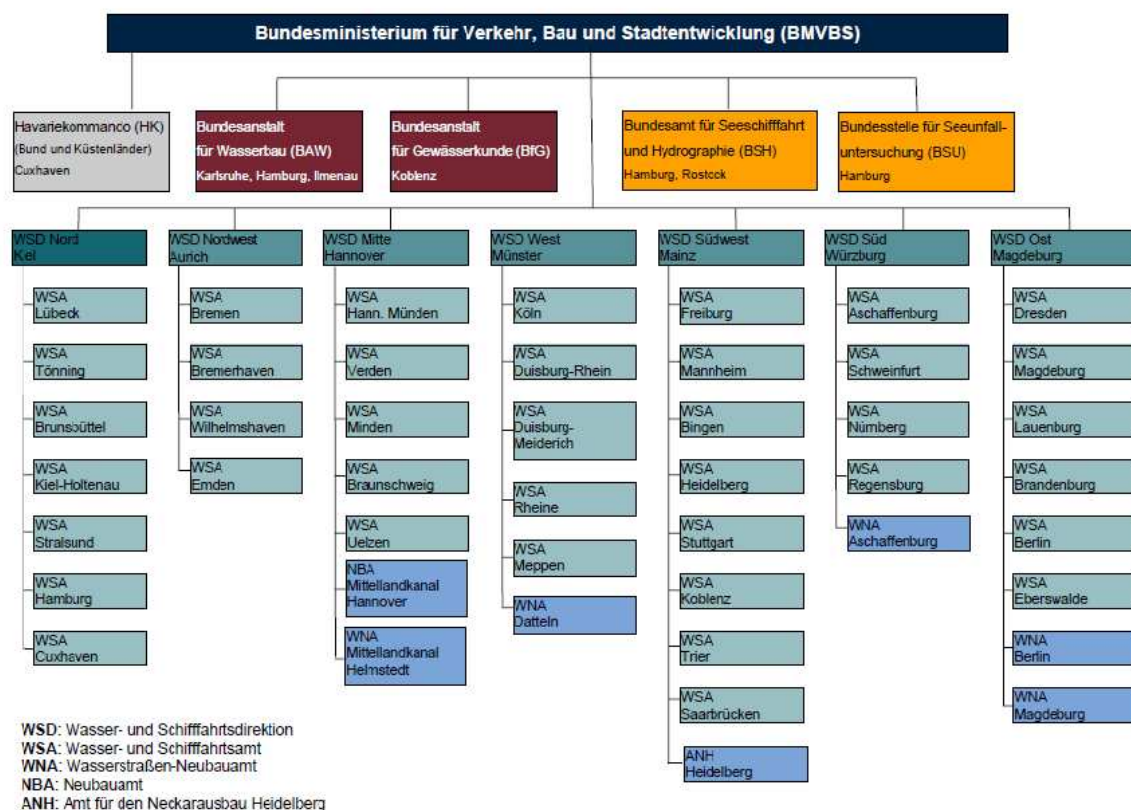
Figure 14 Organisation of the German Ministry of Transport [Wasser- und Schifffahrtsverwaltung des Bundes/ http://www.wsv.de/Wir_ueber_uns/organisation/organigramm_29-01-2007.pdf]

Interviews

Interviews in Germany have included:

1) Interviews with Captain Jens Schröder-Fürstenberg, Head of Nautical Publications, BSH

2) Group interview with

    a. Josef Schöning, WSD Nordwest

    b. Stephan Hellwig, WSA Wilhelmshaven

    c. Lutz Wilhelm, Harbourmaster of Wilhelmshaven

    d. Jens Schröder-Fürstenberg, BSH

The group interview was conducted by teleconference, using an interview guide prepared by BSH, Jeppesen, and Mälardalen University. Captain Schröder-Fürstenberg reviewed the BLAST program, the relevant Work Package 4 projects, and the interview guide with the group interview participants before the teleconference. He collected the responses to the interview guide and validated the documented input with the participants.

Findings

Figure 15 represents the general information flow between the primary stakeholders involved in reporting changed and new nautical information, validating the input, and publishing the information for German waters.
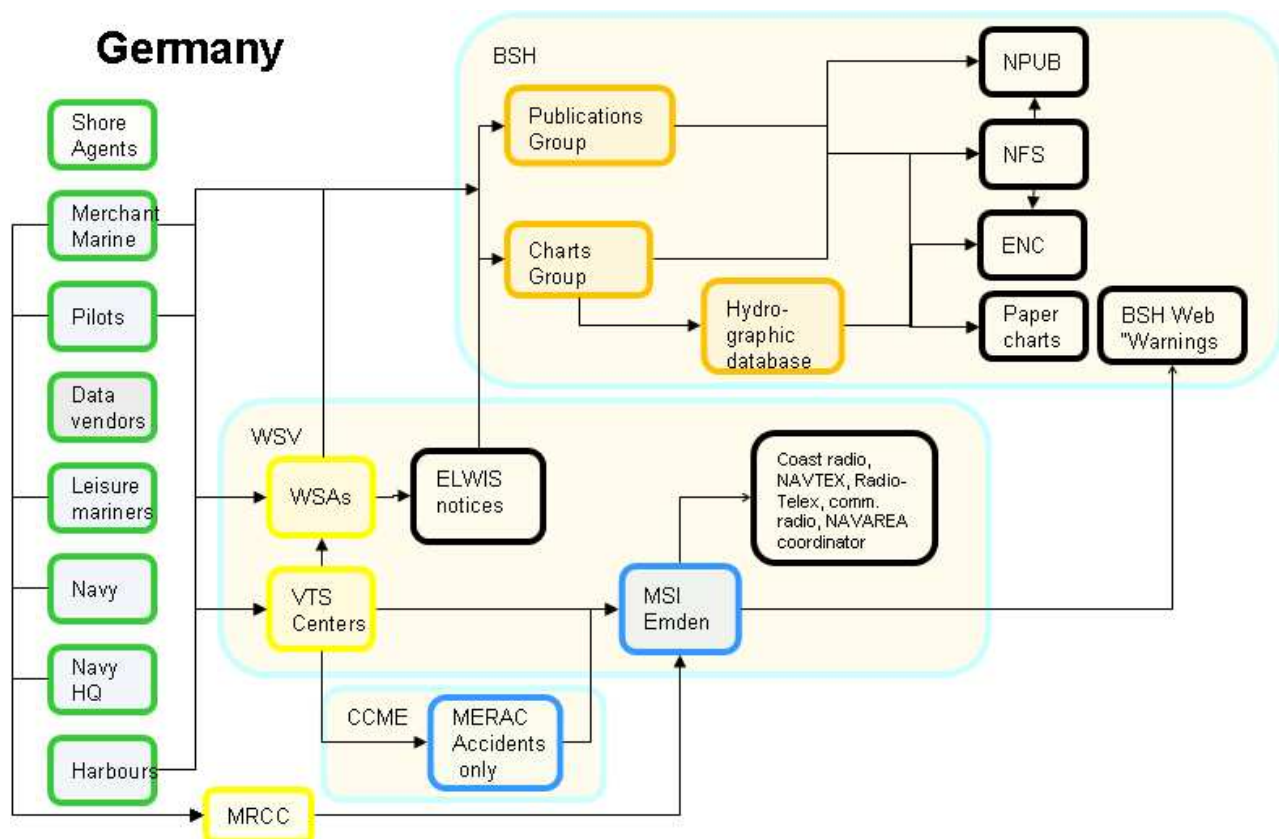
Figure 15 Information Flow in Germany.

Report originators

The types of report originators (the green boxes in the flow diagram) in Germany are similar to any other North Sea state.

Germany reported that Pilots are a major source of the new reports received from the ports and waterways (similar to the other countries.)

Germany advised that "new reports" that impact official publications do not only come from the list of originators shown in the charts. A considerable portion of the new information originates within government organisations.

The role of Shore Agents in Germany is reported more or less similarly to what was said in the Norway interviews: Shore Agent communications are primarily aimed at ensuring that waterway and harbour publications are accurate, current, and ensure safe and efficient transit for ships they represent. The German interviews focused more on the routine Situation Reports coming

from ships and Shore Agents, while the Norway interviews focused more on specific, situational requests from Shore Agents, asking the hydrographic agency to confirm depths in fairways and berths. It may be a shortcoming of the interview method that ad-hoc reporting from ships and shore agents were not discussed in more detail.

The role of Data Vendors was not defined in the German research.

The flow chart for Germany shows that Harbours may send reports directly to BSH. It is presumed, but not confirmed, that reports made by Harbourmasters and other Harbour stakeholders are reports of construction, demolition, addition of or changes in positioning or function of private aids to navigation, etc.

First-line report receivers

In Germany, the goal is that all reports of a non-urgent nature should be reported to VTS. The BSH interview confirms that VTS covers 100% of the coastline in Germany. Reports called into VTS by VHF are recorded; telephone calls to VTS centres are not recorded, due to German law. The interviews mention logbooks maintained by the VTS centres, although reports may at times be initially noted on plain paper notepads.

Figure 16 VTS Centres (red squares), WSA offices (black diamonds) and WSA service areas in the North Sea and Baltic Sea areas. [Wasser- und Schifffahrtsverwaltung des Bundes/
http://www.wsv.de/service/karten/bundeseinheitlich/pdf/w162.pdf]

The sea area managed by WSA Wilhelmshaven is the red hatched area northwest of Wilhelmshaven. Emden also participates in this area, and supports a WSA office and a VTS Centre. These services should not be confused with Seewarndienst (MSI) Emden, described elsewhere in this report.

Urgent matters are typically reported to an MRCC station or VTS. Headquarters of die Deutsche Gesellschaft zur Rettung Schiffbrüchiger (German Maritime Search and Rescue Service) is in Bremen. There are 54 stations around the German coast. The MRCC stations are first-line report receivers, monitoring VHF 16 at all times. 21 DGzRS vessels can respond directly to emergencies within 5 minutes, and 40 rescue units are manned on demand. Complex emergency situations are forwarded by the MRCC or VTS centres to MERAC, the communication centre of the Central Command for Maritime Emergencies (CCME.) MERAC collects, verifies and assesses all information relevant for dealing with complex emergency situations in the North Sea and the Baltic. CCME – MERAC, located in Cuxhaven, serves all

German waters, and is operated 24/7/365 by experienced master mariners. CCME was established in 2003, it reports to the Federal Ministry of Transport, Building and Urban affairs and bundles the responsibility for planning, preparing, exercising and executing all measures for maritime emergency response. MRCC Bremen as well as MERAC also works in conjunction with the Waterways and Shipping Authorities and the German Navy in emergency matters.
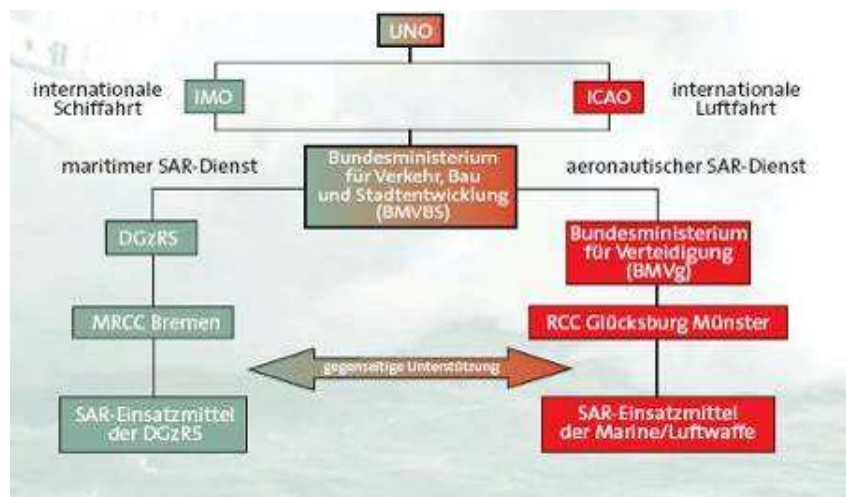

Figure 17 Relationship of MRCC Bremen to other organisations that deal with SAR [Deutsche Gesellschaft zur Rettung Schiffbrüchiger/ http://www.dgzrs.de/index.php?id=666]
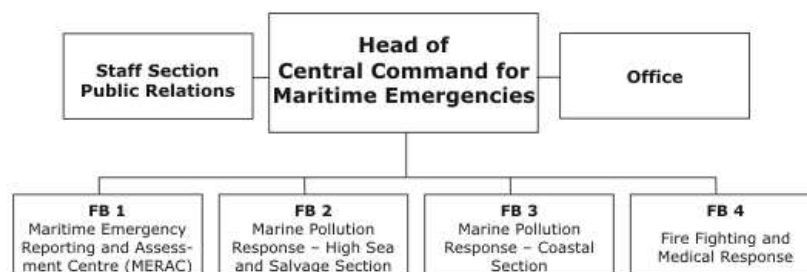
Figure 18 Organisation of CCME [Havariekommando - Gemeinsame Einrichtung des Bundes und der

Küstenländer/ http://www.havariekommando.de/en/index.html]

The Water and Shipping Authority offices also serve as first-line recipients of new reports. WSA may be the best place to report issues with aids to navigation, since they are responsible for managing AToNs, regionally. WSA Wilhelmshaven, for example, also maintains the federal waterways, the Wilhelmshaven sea lock, manages security, and manages port facilities and hydraulic engineering for the Navy in this port. The WSA offices have the authority to process and publish certain nautical information themselves.

Pilotage in Germany is performed by local associations of pilots that are contracted to a port. There is a Federal Pilots Association, but it does not appear to receive or organise reports of chart or publications issues, or emergency issues, sent by pilots.   In the Group Interview it was asked whether Pilot reports to VTS might be prioritised above other types of reports. Interviews indicate that Pilot reports are not prioritised above other sources. Pilots may contribute a large

proportion of new reports to VTS, but there is no evidence of convergence on 1 type of pilot PC application or reporting streamlining, such as was observed in Norway.

BSH does have forms on its website designed to collect local reports first-hand. Similarly to other countries in the study, Germany said these forms are rather new, and aren't much used at the present.

Processors and publishers of nautical information

Seewarndienst (MSI) Emden receives and processes requests to publish warning notifications to the maritime community for the German North Sea and Baltic coasts. They receive requests from VTS Supervisors, MERAC, and MRCC Bremen. MSI Emden handles information published in several forms:

- NAVTEX - Station Offenbach (for the North Sea)

- Radio Telex Service – Station Offenbach

- BSH Web Warnings – BSH (publishes all warnings in force enhanced by local information and those usually distributed by commercial broadcast only)

- Coast Radio Broadcast – MRCC Bremen

- VTS Centre Information Services

- Commercial Radio Broadcast

Since all German coastal areas are included in NAVAREA 1, NAVAREA warnings are processed by the NAVAREA 1 coordinator in Britain for the North Sea, and in Sweden for the Baltic. NAVTEX and NAVAREA warnings are often combined in public-facing presentations for the North Sea Region, though. NAVTEX Pinneberg broadcasts the warnings on 518khz.

The Water and Shipping Administration receives, processes, and on their own authority publishes two types of navigation notices:

- Bekanntmachungen für Seefahrer (BfS) - Notices to seafarers, for coastal areas within the 3 mile limit.

- Nachrichten für die Binnenschifffahrt (NfB) - Notices to skippers, for inland waterways.

Both are published and dynamically updated on the Electronisches Wasserstraßen Informationssystem (ELWIS) website: http://www.elwis.de/. ELWIS publishes quite a wide variety of information including shipping law, water levels and tidal information, ice reports, shipping charges, etc. The German interviews report that the procedures for deciding whether an ELWIS notice will be published, and how, are contained in Verwaltungsvorschrift (Administrative Procedure) 3303. As shown in the information flow diagram, BSH monitors ELWIS as a source of input that might affect the nautical publications and charts they manage.

BSH receives, processes, and publishes nautical information including the SOLAS carriage-required publications and official charting, including

- Paper Charts

- Electronic Navigation Charts

- Notices to Mariners (NfS)

- Sailing Directions

- List of Radio Signals

- List of Lights

- Natural Conditions and Tide Tables

In addition to receiving certain kinds or reports first-hand from the reporter, BSH also monitors certain legal publications, port publications, etc. BSH has scripted applications that monitor ELWIS for changes and if ELWIS files have changed, they are also updated in the BSH "Navigation Warnings and Information Service."

BSH, like other Hydrographic Offices in the region, says they sometimes must investigate local publications or call local/regional stakeholders to discover information needed to maintain their published nautical information. The German interviews note that sometimes hydrographic offices exchange information. This is much in line with the objectives of BLAST and INSPIRE. BSH maintains a subscription Notices to Mariners web service. The BSH Nachrichten für Seefährer (NfS) are distinct from the ELWIS BfS notices; the BSH NfS cover offshore and inshore coastal waters. BSH processes ELWIS BfS notices if considered necessary.

Examples of nautical information forms and reports in Germany

Figure 19 WSA ELWIS BfS Input Form [Wasser- und Schifffahrtsverwaltung des Bundes/ http://www.elwis.de]

Figure 20 ELWIS BfS Web View [Wasser- und Schifffahrtsverwaltung des Bundes/ http://www.elwis.de]

Norway

Organisations

In Norway, management of nautical information at the government level is accomplished by several organisations. The BLAST primary research identified the following agencies as having a critical role in nautical information management:

- Ministry of Trade and Industry and the Ministry of Environment
    - The Norwegian Maritime Directorate
- Ministry of Fisheries and Coastal Affairs
    - Norwegian Coastal Administration (NCA)
- Ministry of the Environment.
    - The Norwegian Hydrographic Service (NHS)
- **Telenor**
    - **Norwegian Coast Radio**
- Selected survey port
    - The Port of Stavanger

The Norwegian Maritime Directorate

Sjøfartsdirektoratet (The Norwegian Maritime Directorate - NMD) is an organisation under the Ministry of Trade and Industry and the Ministry of Environment. The directorate has jurisdiction over ships registered in Norway and foreign ships arriving Norwegian ports. The directorate's main goals are to prevent accidents and to achieve a high level of safety for lives, health, vessels and the environment. The Norwegian Maritime Directorate has three key tasks: 1. To ensure and contribute to Norwegian ships keeping the highest level of safety and environmental standards. 2. To ensure and contribute to sailors on board Norwegian ships having good qualifications and good working and living standards. 3.To ensure that foreign vessels in Norwegian waters and ports keep in line with national and international laws and regulations. (http://www.sjofartsdir.no/en/About_the_Norwegian_Maritime_Directorate/ acc. 100226)

No further investigation on NMD has been done as the discrepancy reporting which is in focused in this report is outside the domain of the directorate.

Norwegian Coastal Administration

Figure 21 *NCA regional office in Haugesund [photo NCA]*

Kystverket (Norwegian Coastal Administration – NCA) is a governmental body under the Ministry of Fisheries and Coastal Affairs responsible for safety and environmental protection along the coast. NCA is present along the whole of the Norwegian coast, and delivers a variety of services for all kinds of users of Norwegian waters. NCA's most important tasks are:

- Piloting services
- Vessel Traffic Services (VTS)
- Maintaining lighthouses and buoys and issuing navigational warnings
- Improving coastal channels and constructing and maintaining fishing ports
- Taking care of the State's preparedness against acute pollution
- Managing legislation (e.g. the Norwegian Pilotage Act, the Harbour Act and parts of the Pollution Control Act)
- Administrating the national ship reporting system and other information systems

The head office of the Norwegian Coastal Administration is located in Ålesund. Here you find the central authority of the Coastal Administration. The head office receives its assignments within the area of coastal management from the Department of Fisheries and distributes these among the operative units; the coastal regions. The Norwegian Coastal Administration's Department of Emergency Response, is located in Horten.

The Norwegian Coastal Administration has divided the coast into five coastal regions with regional offices in Arendal, Haugesund, Ålesund, Kabelvåg and Honningsvåg. These five offices have been delegated the responsibility of running daily operations within their geographical areas.
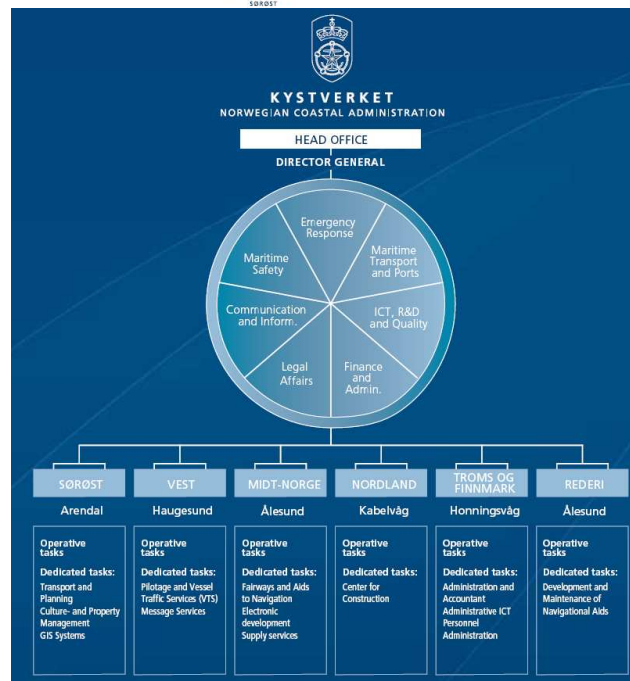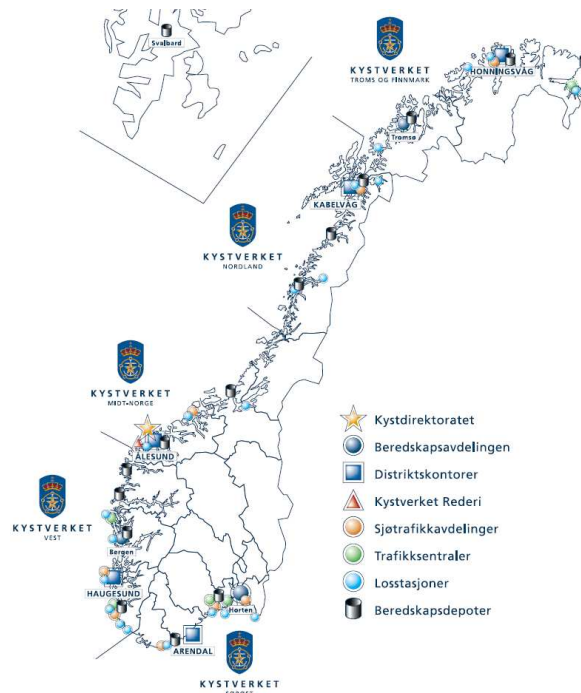
Figure 22 Organisations within the Norwegian Coastal Administration [NCA]

NCA have also dedicated special tasks to the different regional offices. One such task that is interesting for our investigation is Fairways and Aids to Navigation (Farled, fyr og merker, FFM). The head office for this task is Alesund, and they have the responsibility for maintaining lights and aids to navigation. They also have access to ships and personnel

24/7/365 to do repair work at any time. There is an FFM group at every regional office around the coast.

Norwegian Hydrographic Service

Under the Ministry of the Environment, Statens Kartverk (the *Norwegian Mapping Authority* - NMA) is the national provider and administrator of geodesy, geographical and cadastre information covering Norwegian land, coastal and territorial waters. The Hydrographic Service is a division of NMA.

Statens Kartverk Sjø (Norwegian Hydrographic Service – NHS) The Norwegian Hydrographic Service is responsible for surveying the Norwegian coast, including polar waters and for preparing and updating nautical charts and descriptions of these waters. The Norwegian Hydrographic Service has operational responsibility for the international electronic nautical chart centre Primar Stavanger. NHS activities also include studies of tides and currents and publishing tide tables, and NHS maintains the Norske Los (Norwegian Pilot Guides) and the Notices to Mariners for Norwegian waters.

Notices to Mariners (*Efterrettningar for Sjøfarande* – EfS) is published by NHS every 14 days, both in print and on the web.

Telenor

Telenor is a diversified, privately owned Norwegian telecommunications company which runs Telenor Maritime Radio as a government subsidised task. Telenor Maritime Radio runs five coastal radio stations: Tjøme, Rogaland, Florø, Bodø and Vardø Radio. The coastal radio stations send navigational warning every 4 hours, day and night, the whole year around on 2182 kHz and Channel 16. They also listen on Channel 16 and regional working channels and relay messages like discrepancy reports.

The Port of Stavanger

Stavanger has a crucial role in offshore supply and maintenance for the Norwegian oil trade. It is a diversified port, serving as a logistics centre for the import, export and redistribution of goods in Southwestern Norway, and it supports considerable traffic from ferries, cruise ships and yachting, also. Stavanger is the headquarters of NHS and the Primar Regional ENC service, and the Western office of Kystverket is nearby in Haugesund.

Stavanger is part of a network of ports around a large inshore waterway. Greater Stavanger Port Authority is the port management company, owned by four municipalities: Stavanger, Randaberg, Rennesøy and Sola. Greater Stavanger Port Authority oversees construction of public port facilities to meet civic plans, and leases and operates port facilities through a wholly owned subsidiary, Greater Stavanger Port Operations A/S.

Stavanger is typical of major Norwegian ports in that many maritime services are managed by Kystverket. They supervise the Kvitsøy VTS and Pilot Service in this port.

Interviews

Interviews in Norway have included the following persons:

1) Norwegian Coastal Administration (NCA)
   a. Steinar Jessen, Head engineer, Harbour and waterways department, Arendal
   b. Oddvar Salomonsen, Harbour and fairways department, Arendal
   c. Modstein Hansen, state pilot, Karmøy
   d. Ole Kristian Klausen, VTS operator, Kvitsøy
   e. Tommy Haugsnes, head of piloting
   f. Tor-Inge Miljeteig, pilots, VTS, AIS, SSN, METOC
   g. Tormod Våga, head of Kvitsøy VTS
   h. Malin Dreijer, senior nautical adviser
2) Norwegian Hydrographic Service (NHS)
   a. Torstein Ådland, Nautical Information Group, NtM editor
3) Port of Stavanger
   a. Helge Haaland, Harbour master

Some interviews have been telephone interviews person to person and at one occasion a group interview conducted at NCA in Haugesund during several hours.

Figure 23 represents the general information flow between the primary stakeholders involved in reporting changed and new nautical information, validating the input, and publishing the information for Norwegian waters.
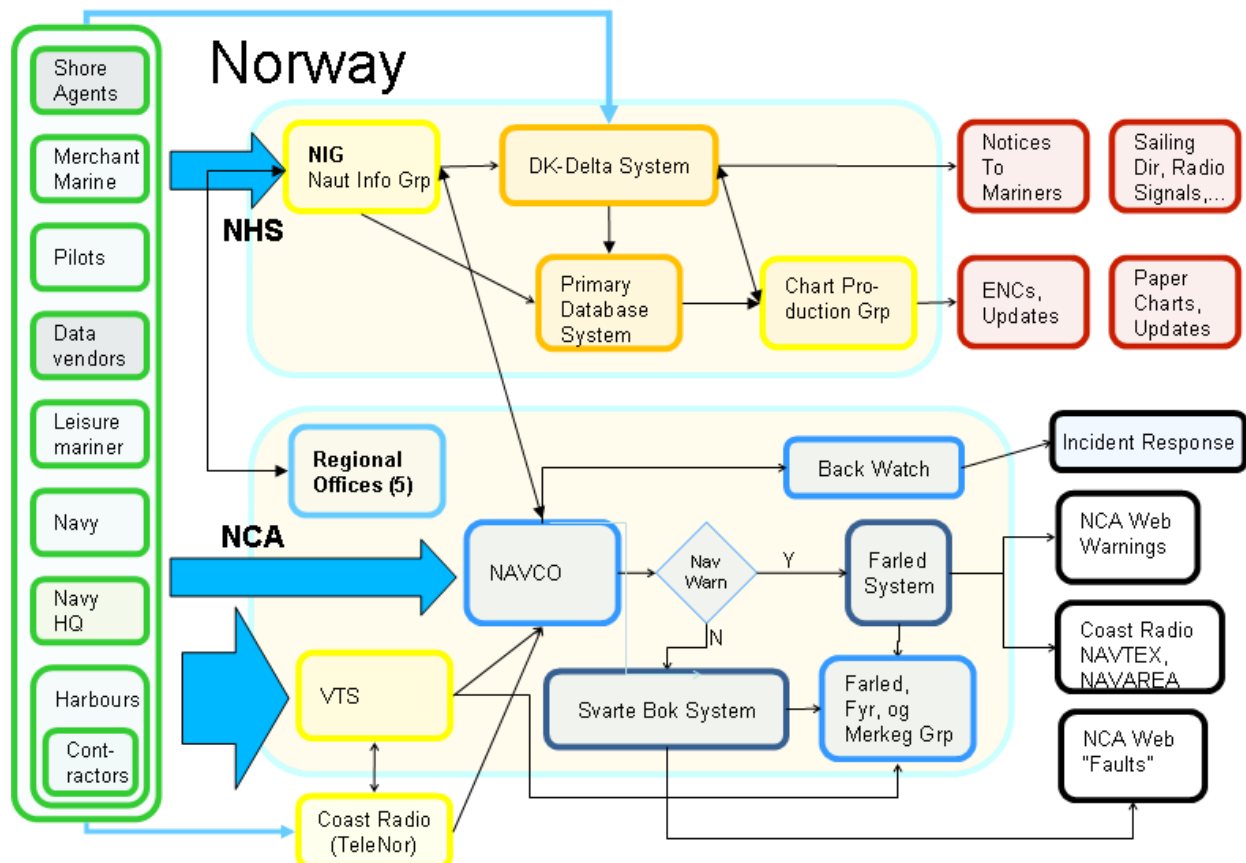
Figure 23 Information flow in Norway.

Report originators

NCA officials interviewed say that most of the reports originate from bridge officers in the many inshore ferries and cargo ships on scheduled routes in the Norwegian archipelagos. Reports most often come by VHF to the 5 VTS centres (Horten, Brevik, Kvitsøy, Fedje and Vardø) when within their zones, and to one of the 5 coastal radio stations (Tjøme-, Rogaland-, Florø-, Bodø-, and Vardø radio) when outside of a VTS zone.

The NHS reported pilots as the foremost reporters of discrepancies targeting changes in the navigational charts. Figure 24 shows an example of such reports sent in by a pilot (Modstein Hansen). Captain Hansen, like several other state pilots in NCA, has a background as

hydrographer and he and other pilots are therefore well suited to the discrepancy reporting task.
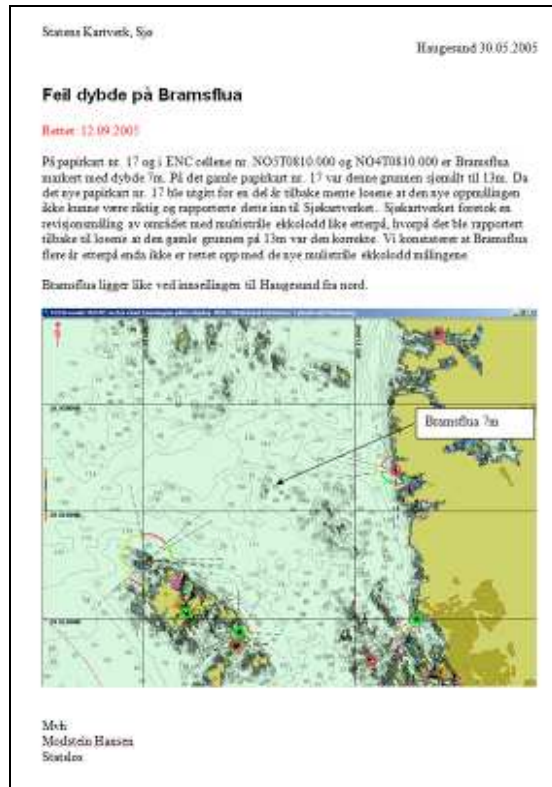
Figure 24 Example of discrepancy report sent in to the HSA by the pilot Modstein Hansen. [courtesy Modstein Hansen]

Pilots have on their Pilot PC's an on-line reporting utility that allows mobile phone on-line reporting to the Maritime Directorate, and also to a database shared by pilots, but these reports deal with ship accidents, incidents, conditions, and manoeuvring characteristics.

Foreign ships with pilot onboard report through the pilot, foreign ships without a pilot seldom report according to our respondents, or if they report it often goes through their shore agent.

Reports from shore agents often deal with draught in ports. It is in their interest to maximise the cargo capacity of their customers and there is always a clearance between the real draught and the soundings in the chart. Pilots will not bring in ships with a draught larger than the maximum draught printed in the chart, so there are requests to update charted depths.

First-line report receivers

Reports from mariners at sea which are called in by VHF to the VTS centres or the coastal radio stations are noted down on plain paper and then forwarded to the national coordinator at Brevik VTS by telephone.

The blue arrows in Figure 23 show three major information streams in the discrepancy reporting in Norway. For ships in one of the five VTS zones in Norway the natural point of contact is through VHF radio to the VTS centre. However, outside a VTS zone the manned coast radio stations (Tjøme, Rogaland, Florø, Bodø and Vardø Radio) are the point of contact. In the Stavanger area, the Kvitsøy VTS centre or Rogaland Radio will note down the incoming report and forward it by phone to the VTS centre in Brevik, where the watch keeper for the national coordinator (NAVCO) is stationed.

It can be the case that NHS acts as a first-line report receiver. For instance, some public facing forms on the NHS website interface to the DK Delta system used by the NHS Nautical Information Group. The Nautical Information Group also receives reports from the regional NCA offices and NAVCO. Actually, information flows both ways in the NHS–NCA relationships.

Processors and publishers of nautical information

The VTS will warn ships in its area until the navigational warning forwarded to NAVCO in Brevik is read on the Navigational Warnings by the coastal radio stations on VHF working channels and MF at 2.33 a.m. and then every 4 hours 24/7/365.

The National Coordinator (NAVCO) is the central hub for navigational warnings in Norway. It is a task assigned to the watch at NCA's VTS centre in Brevik in the south of Norway. Reports reach Brevik either by VHF from its own VTS zone, but otherwise via phone from the other VTS centres or the coastal radio stations or by phone direct from ships in Norwegian waters within mobile phone range. The number to NAVCO (and to NHS) is printed at the bottom of all Norwegian charts, and is also published on the NCA WB.

When NAVCO receives a discrepancy report that is both "urgent and a hazard to shipping" and decides to make a navigational warning about it, they write it into a system called *Farled* (see Figure 25).
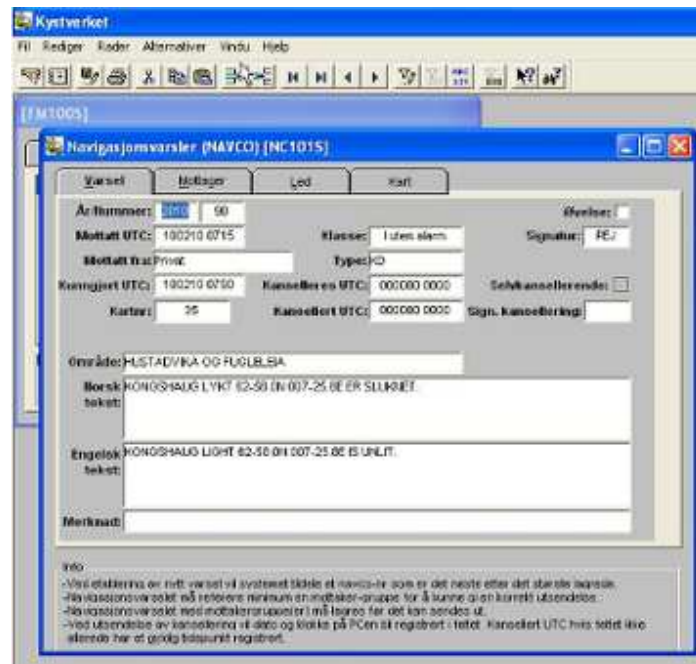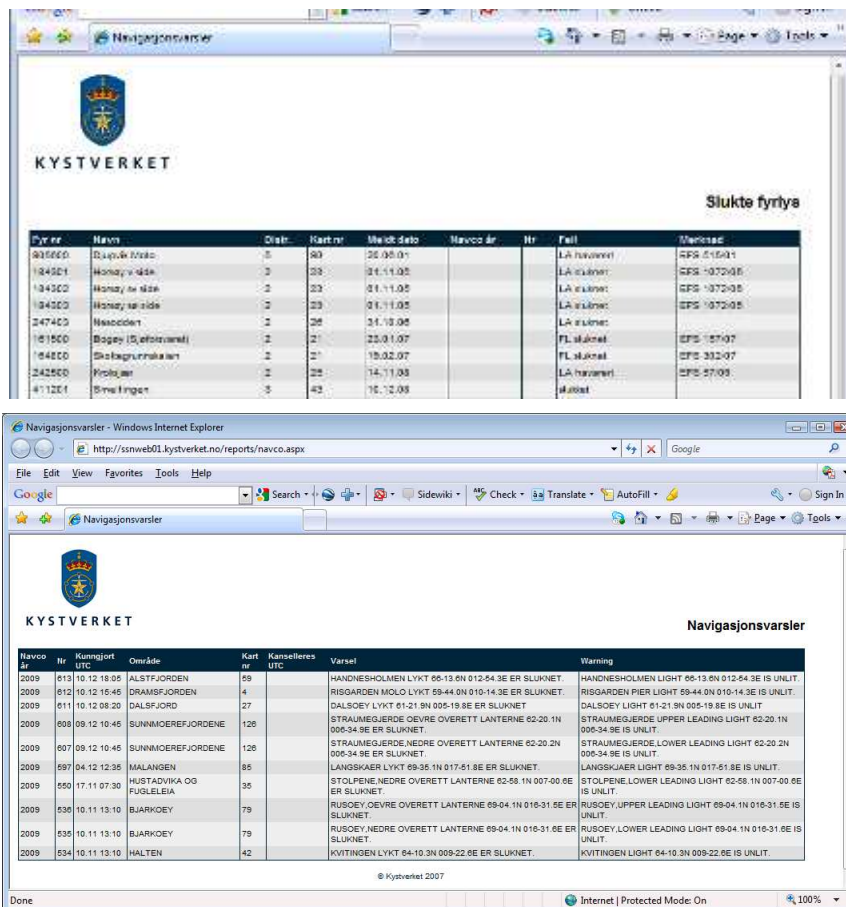
Figure 25 Screen dump from the Farled system used by NAVCO to issue navigational warnings. In this case it is Kongshaug light that is extinct. [NCA]

This system will then distribute the warning text to the right coastal radio station for the area in question where the text will be read every 4 hours. It will also send a copy of the warning to the regional FFM office in question so that repair work can start as soon as possible. The system will also update the warnings on the NCA's web site. If the warning concerns an extinct light the "Extinct lights" web page will be updated and if it concerns some other warning the "Navigational warnings" page will be updated (see Figure 26).

Figure 26 The "Extinct lights" and the "Navigational warnings" pages on the NCA web are automatically updated as NAVCO files a warning in the Farled system. [NCA]

If the report concerns an incident that is not considered "urgent or a hazard to shipping" but still needs to be taken care of or repaired, NAVCO will file a report in another data system called Svartebok (Black book – see Figure 27). This entry will then be forwarded only to FFM and their appropriate regional group. Faults on light installations will be presented at a separate web page on the NCA web named "Extinct Lights" (see Figure 26, bottom). All faulty light presented in the navigational warnings will be here, but not vice versa.

Figure 27 Svartebok, the NCA's incident reporting system for non-urgent matters. [NCA]

If there is a major incident that needs immediate response NAVCO can scramble *bakvakten* (the back watch) which consist of 5 senior master pilots one of which is always on duty. These have experience and access to all emergency resources.

If a malfunction, like an extinct light or a missing buoy, is expected to last more than 14 days NAVCO will report it to NIG group at NHS. 14 days is the publications cycle of NtM.

Future, planned events may not be considered urgent, but they might still a danger to shipping. These will then not result in a navigational warning but are to be reported to the NtM group at NHS according to the NAVCO instructions. A problem here can be that an incident may be planned to a time in the future, but still prior to the publication of the next issue of NtM.

Within NHS, the strategy is that all incoming reports should flow through the Nautical Information Group. The Nautical Information Group coordinates with those who produce and maintain charts and publications for NHS.

Discussion

What works well today and desired improvements

What works well today

Generally, respondents in all 3 countries felt that management of new and changed maritime information works reasonably well today, considering the constrained availability of resources to do this work.

Digital information management solutions in use

All 3 subject port states have invested in digital solutions to support maritime information management. Some key examples:

- COTS records management and workflow solutions: Both NSC-HO and DaMSA use Captia to manage some aspects of nautical information processing. NHS uses DK Delta in a similar way. These 3 hydrographic offices use combinations of tools such as Jeppesen dKart™ and Caris HPD™ to manage their chart databases.

- Other software solutions for records management and publishing, either internally developed by the government agency or highly customised to task:
  - Farled system - used by NCA to manage navigation warnings in Norway
  - Svarte bok (black book) system used to manage non-emergency reports (NO)
  - Editing of Navigation Warnings system used by DaMSA DB department
  - ELWIS – used by the German WSA offices to maintain coastal and inland notices and warnings (notices are mirrored on the BSH website and used as one input to the NfS notices to mariners they publish)

- Publishing solutions that present nautical information to the maritime community:
  - All 3 countries provide notices to mariners online through their websites.
  - All 3 countries provide navigation warnings through their websites.
  - Lists of extinct lights are published in all 3 countries
  - Note that there is considerable variety in how the above information is published, though.

Information from pilots

Pilots are considered an important source of reports of chart and publications defects in all 3 countries, but there appeared to be significant variation in how pilot reports are prepared and sent to coastal authorities and hydrographic offices. In Norway, pilotage is managed by NCA, and pilots use one form of PPU solution. Reports to the HO are free-form email, but screenshots from the PPU are used to augment the email reports. It does not appear this is the case in Hirtshals or Wilhelmshaven. NHS tells us the relationship and flow of information with pilots works well.

Use of forms to collect information

All 3 countries do use web-based forms to collect issues with charts and publications from mariners. It may be that such forms published on coastal administration websites are used more often than similar forms offered by hydrographic offices. HOs told us that their online forms do not seem to be extensively used by mariners at this time. There is much variation in web methods of collecting information today. For example, the BSH website uses a 5 page PDF form with many fields used to collect specific information, while the current KMS website triggers a blank email addressed to a specific KMS recipient. The NHS web form is somewhere in the middle. In contrast to the relatively lower use of public-facing intake forms, web-based forms for expert users, such as the input forms for ELWIS in Germany, the Redigering af Farvandsefterretninger system in Denmark, and the Farled system in Norway are highly used by these experts every day.

Procedural (human) systems

In all 3 countries, the most vital part of maritime information management today is the people who manage it and who invent better ways of solving problems. In every case in this study, there are examples of people following written procedures but also examples of less structured, unwritten methods, also.

Reports received by VHF are recorded by VTS personnel, but reports by telephone are noted on paper, and then relayed by phone or email, if needed. This may require using a calling list to reach the on-duty officer at the recipient organisation.

Regional differences

There are regional differences in how information is collected; in Germany, there is 100% VTS coverage and the stated goal is to have all non-emergency reports flow through VTS. By contrast, VTS in Denmark covers only the trickier Eastern North Sea passages into the Baltic. In Hirtshals and other West Denmark ports, locally-operated port control does what VTS would otherwise do. In Norway and Denmark, where VTS coverage isn't continuous, an accepted practice is to contact coast radio when out of range of any VTS centre.

There are also significant regional differences in the way response to maritime reports is handled. This is partly due to the structure of government agencies. For example, in Norway NCA has a much broader, nationwide scope. There, 100% of coastal warnings go through the NAVCO group in Arendal. In contrast, Germany puts much more authority at the local level, and one result is that mariners get some navigation notices from WSA (ELWIS), others from BSH, and still others from coast radio. It may be that these messages are well organised from the standpoint of those managing the systems, but mariners who transit between these North Sea states must know how to work with the differences in how information is published.

Areas of interest in improvements

There were notable differences by country in opinion about aspects of maritime information collection that could be improved. This seems to be primarily a result of the differences in how maritime information management is structured in the 3 countries. One implication for

anyone wishing to try building a harmonised maritime information solution is that the system needs to be modular and flexible enough that each country can adopt the parts of the solution that it needs while in all countries the net result is a solution that has a uniform user interface and which produces consistent results.

That said, several areas of interest were universally deemed worthy of improvement.

Harmonise forms used to collect information

In a February WP4 Workshop in Stavanger, Partners concurred that forms used to collect mariner reports and manage transfer of information between shore-based organisations would need to reach harmonised definition of types of content being collected. They advised that the number of different forms should be reasonable and the layout of the forms be easy to follow. They thought that forms should auto-fill repetitive information such as vessel characteristics, MMSI, etc. They said it's important to provide good instructions for such forms.

Workshop participants also expressed interest in being able to collect information in optional formats (online forms, downloadable forms that could be kept locally and re-used as needed, and the ability to submit reports in a variety of formats.

Simplify the reporting process. Make it easier to understand and user friendly

Respondents in all 3 countries expressed some difficulty getting enough information from mariners and coastal stakeholders, especially as the demand for current, comprehensive information increases with the movement from paper to digital formats for information.

Conversely, mariners that we surveyed said two interesting things:

- They feel they sometimes need to report the one incident to multiple shore-based recipients because they are concerned (possible uncertain) which recipient might act on their reports. (Note that shore-based interviewees did not see multiple reports as creating major issues.)

- They would like more feedback from shore-based agencies indicating action taken.

In the Workshop in Stavanger, BLAST Partners responded to Web UI mock-ups from Jeppesen, and gave several suggestions for how to make the entry level User Interface more friendly and able to help users self-select the best way to report issues. **They reiterated the desire for such systems to provide status feedback to the report submitter.**

It also became clear in this research that "expert" users (e.g., VTS and Coast Radio personnel, Coastal Administration duty officers, and hydrographic office personnel) require specialised formats for input. An example: in Germany interest was expressed in making the paper VTS logbooks digital.

Create the ability to locate and mark up chart and publication content online

Among all groups researched, there was strong interest in systems that enabled on-line chart mark-up tools to indicate an area or object being reported. There was also interest in being able to locate specific passages in current nautical publications, when reporting these, although it might not be as easy to visualise how this might work.

A variation of this need: there was consistent interest in supporting reports that contained pictures, drawings, or diagrams (regardless whether they were made by online mark-up or cut-and-paste into email, etc.

Better method for collecting "planned activities" (construction/maintenance, etc.)

Generally, this research indicated that hydrographic offices are seen as the primary recipient of plans for construction, demolition, dredging, and other planned activities of longer duration. However, the hydrographic offices in the subject port states said this is some of the most difficult information to get port stakeholders to provide. It is difficult to keep port stakeholders aware that this information is required, and it is not easy to describe what the rules and requirements are. Also, the format of this type of information is not easy to transmit by typical means (e.g. email attachments.)

Workshop attendees became noticeably interested when we showed prototypes of a web-based report viewer interface that could organise a variety of information about a port project into one view.

Some respondents mentioned that better notice and description of planned military exercises would also enable them to improve maritime safety and commerce in the North Sea region.

Create "switchboard" functionality and report routeing

All hydrographic offices said that any trans-nationally harmonised solution would need to support at the national level some means of monitoring status on information in process among all participating organisations in that nation. The intent is not that this switchboard function takes over management of the various organisations in the country, but only to keep track of the information and be prepared to help ensure that it stays harmonised.

Although all organisations interviewed felt that coordination between organisations that manage maritime information generally worked well enough today, there were some specific cases where better coordination or better tracking could be beneficial. The primary point expressed by participants in the Stavanger Workshop: a switchboard function enabling monitoring of information flow is useful, but it must not be designed such that inbound reports become stuck in queue waiting to be assigned for action. Maritime safety, environment, and economy are affected by these reports. All incoming reports must be received by a first-line recipient.

The potential for trans-national harmonisation of information

There are three powerful advantages of harmonised maritime information:

- It is easier for multiple, localised or specialised data owners to maintain harmonised data.
- It is easier to effectively engage mariners and others in updating and correcting the data.
- It is easier to develop and maintain cost-effective applications for harmonised data.

At the same time, harmonisation of maritime information is not a cure-all. Participants in the BLAST WP4 Workshop in Stavanger clearly stated the benefits and caveats of harmonisation:

- It is beneficial to harmonise maritime information in the North Sea region, for the above stated reasons, but

- It is also beneficial and necessary for the sake of the accuracy of nautical information to preserve the unique, local aspects of the information. After all, the characteristics of how ports develop, the language used to name landmarks, port regulations and requirements all primarily come from the local culture and environment.

Thus, harmonisation of maritime information involves finding the right balance between trans-national and local considerations. This is not easy. Achieving it requires development of a shared view, putting the work of international standards and regulatory groups to the test in real-world environments such as the BLAST programme, and collaboratively shaping practical results. Projects that follow upon this State of the Art research in Work Package 4 must be done with this in mind.

Nautical publications management today

This report has identified the organisations responsible for publishing the core information of interest in BLAST Work Package 4, and it has described in some detail how information is collected to support the core nautical publications, but less time has been given to detailing the methods of production of this material.

There was a practical decision by the research team to focus on state of the art for data collection, for several reasons:

1) During the primary research it was discovered that collection of data for nautical publications is more diversified, and more in the domain of coastal authorities than initially anticipated.

2) There are significant regional variations in how data is collected and processed between the 3 subject port states. There are also significant differences in who is responsible for publishing nautical information between these port states. For example, Notices to Mariners are published by the Hydrographic Office in Norway and Germany, but by DaMSA in Denmark; at the same time, handling of NtM information in Hjørring Municipality (Hirtshals) may be more comparable to how this information is managed by WSA Wilhelmshaven than how NCA and NHS manage Notices to Mariners for Stavanger. It was important to shed light on these differences.

3) Management of the "core" maritime publications of interest in WP4 (e.g., Notices to Mariners, Sailing Directions, Lists of Lights, List of Radio Signals, ENC) is well in hand using existing, documented systems within the 3 hydrographic offices involved in the study…. and all 3 of these hydrographic offices are now and will remain partners in the WP4 projects for the duration of BLAST. In other words, it

seemed like a reasonable risk to hypothesise that the partners could revisit the details of how these publications are maintained and published as needed during the development of the 3 demonstration projects in WP4.

Mariners' Routeing Guides and routeing guide management today

General parameters of Mariners' Routeing Guides

Mariners' Routeing Guides serve the purpose of bringing together several critical types of information needed for the task of creating a route plan for a voyage. Historically these have been produced in the form of a paper chart, but now there are examples of digital mariners' routeing guides. Today's examples, digital and paper provide a basis for speculation about the possible impacts of trans-national harmonisation of nautical information.

Mariners' Routeing Guides are impacted by both international and local regulations, including:

- SOLAS Regulation V 10
- IMO Publication "Ships Routeing"
- MARPOL
- GMDSS and other regulations on use of radio services
- COLREGS, SAR, National and local regulations on Pilotage, VTS, etc. ,

Role of existing Routeing Guides in BLAST WP4 work

Because the Mariners' Routeing Guide concept involves international and local regulations and practices, as well as a combination of chart and nautical publications information on a trans-national basis. It provides a useful reference point and test bed for the culmination of the Jeppesen WP4 projects.

Existing routeing guides in the Baltic and North Sea will be considered and used as a point of reference for the advanced Digital Mariners' Routeing Guide project in Work Package 4.

Routeing Guides for the North Sea

There are three mariners routeing guides covering the North Sea region:

- Routeing guide for the English Channel and Southern North Sea (UKHO)
- Routeing guide for the German Bight (BSH)
- Routeing guide for the Baltic Sea (BSH and HELCOM online)

Admiralty Mariners' Routeing Guide for the English Channel & Southern North Sea

The Admiralty routeing guide for the English Channel and Southern North Sea consists of a large format publication containing a mixture of text, diagrams, and specialised chart images. The contents of the major panels are:

- Passage Planning Using this Guide: Guidelines for using the Routeing Guide

- Routeing: General Rules and Recommendations: Overview of international and local regulations in effect

- Routeing: Special Rules and Recommendations: Short section highlighting specific IMO code

- Passage Planning: Special Classes of Vessel: Gives detailed considerations for ship classes

- Oil and Dangerous Cargoes: Marine Pollution: Gives detailed guidance on MARPOL, etc.

- Radio Reporting Systems Applying to Through Traffic: Goes into some detail on Mandatory Reporting Systems as defined in SOLAS and also local considerations for providing notice to agencies which manage ship traffic in the area.

- Reporting to a Port of Destination: Outlines EC, French, and British regulations on reporting ETA and notice of arrival.

- Maritime Radio Services: Provides an overview of radio services including NAVTEX, GMDSS, and Traffic Surveillance Stations in the area.

- Pilot Services: Gives an overview of deep sea pilot service and general guidelines on harbour pilots.

- Tidal Information and Services: Provides diagrams and general guidance on tidal predictions

- Passage Planning Charts: Provides an overview chart and a higher-scale chart showing the sea routes, traffic separation schemes, major ATONs, pilot boarding places, etc.

BSH Routeing Guide for the German Bight

The BSH routeing guide for the German Bight consists of a large-format publication divided into several panels containing information as a mixture of text, diagrams and specialised charts. The contents of the panels are:

- General Information: Information about publications and charts relevant to the area and general statements about the duties of masters in relation to navigation.

- Route planning: General instructions for passage planning, German regulations, and traffic separation schemes.

- Routeing: Descriptions of traffic separation schemes in the area and summaries of right-of-way rules.

- Environmental protection: Summarised information about environmental protection requirements.

- Natural conditions: Notes about normal and extreme tidal conditions (water level, tidal streams and currents).

- VTS: Descriptions of services provided by VTS and types and forms of reporting by vessels.

- Pilot Services: Descriptions of different kinds of pilotage services available (deep sea pilotage, harbour, etc.), pilotage requirements and contact information. Boarding places are marked on the passage planning chart included in this MRG (described below).

- Maritime assistance service: General notes about assistance services and contact information for maritime assistance services for Germany and the Netherlands.

- Maritime Radio Services: Information about MSI broadcasts, NAVTEX, GMDSS.

- Other reports: Reminders about sending arrival reports to ports, ISPS reports and dangerous goods reports.

- A passage planning chart, showing coastlines, depth areas, names of places and areas, TSS and other routeing schemes, calling-in points, pilot boarding places, important lights and marks, anchorages, and limits of various zones (VTS areas, etc.). Unlike the UKHO and Baltic guides, call-out annotations are not used though short fragments of text accompany many symbols. A small number of special warning icons accompanied by text (about fishing and leisure activities) are included.

Digital Mariners' Routeing Guide for the Baltic Sea (HELCOM)

Overview

The Digital Mariners' Routeing Guide for the Baltic Sea is the result of collaborative efforts of several Baltic Sea hydrographic offices: Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia, and Sweden. The online version can be viewed at http://www.helcom.dk/map/index.htm.
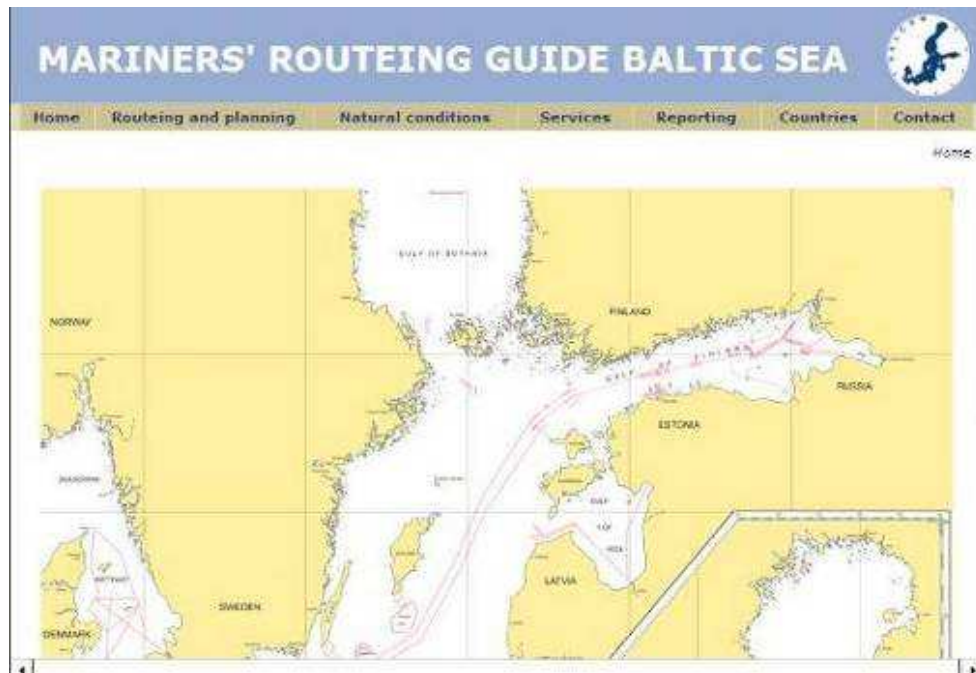
Figure 28 HELCOM Mariners' Routeing Guide to the Baltic Sea [image HELCOM]

It provides similar kinds of information to that found in other routeing guides, but this digital presentation holds much more detailed publications content. There is a paper version of the routeing guide, but the web-based version offers additional functionality:

- Users may select a view of general routeing and planning information by subtopic, or filter and view the routeing guide content by Country (Countries tab) or by the major topics shown as tabs under the banner of the home page.

- Drilling down and selecting detailed topics such as Pilotage for Denmark triggers presentation of detailed text, chart images and diagrams in the form of PDF documents.

Hence the HELCOM Digital Mariners' Routeing Guide can support much more content than the paper chart version because the digital medium makes it possible to dynamically maintain an organised, context-driven presentation of relevant information.

Potential improvements using trans-nationally harmonised maritime information

There are several areas in which harmonised maritime information and improved information collection techniques might lead to improved Mariners' Routeing Guides:

- In areas like the North Sea region which involve multiple port states, harmonised information could support more intuitive, consistent user interfaces. For example, one might consistently find pilotage information for different countries using the same

search processes, and the content found could be uniformly formatted. The content itself could be tailored to the local language, customs, and regulations, but the page layout, headings, etc.

- Use of emerging IHO standards that integrate nautical publications information object types with chart object types might allow better integration of text information and chart information in digital applications such as mariners' guides.

- Use of harmonised, streamlined information collection and processing techniques with international cooperation (similar to what Safe Sea Net is doing) could help data suppliers keep the mariners' routeing guide current and accurate at all times.

These are just a few examples of the potential benefits of the work that has started with the work of the partners in BLAST Work Package 4.

Conclusion

Summary

There is considerable variation in the processes involved in collecting maritime information among the three states.

The organisations most involved in public-facing collection of maritime information are coastal administrations, VTS centres (or harbour watch), and coastal radio. Hydrographic offices get some information directly from mariners, pilots, and ports, and some via the other organisations. There are also several other sources such as port authorities. The coastal authority or HO also actively gathers some information e.g., legal requirements and of course surveying.

Processing and publishing tends to be centralised in the coastal administrations and hydrographic offices.

Most agencies use workflow management systems (commercial or in-house) and tools to track reports, and other software tools (often built in-house) to produce and manage the outputs (mostly marine safety information for the public).

Internal workflow - e.g., communications with repair offices and between chart and publications uses both institutional knowledge (whom to inform, about what, and under what circumstances) and software systems (processing in Norway).

All three ports maintain web sites and this is generally true of most ports in the three countries.

Recommended action by BLAST WP4

There was general satisfaction with the functioning of the current systems among the agencies, but room for improvements was mentioned, in particular:

- Harmonisation of forms used to collect information

- Simplification of reporting processes and more user-friendliness in software
- Ability to mark-up charts and publications online when reporting changes and defects
- Improved method of collecting detail on planned activities (construction, dredging, etc.)
- Enabling administrators to monitor and impact information flow

Vision for the future

Keeping nautical information current in the digital age

It is in the interest of the users (mariners) as well as publishers of maritime information (coastal authorities and hydrographic offices) that the charts and nautical publications used by mariners be kept as up to date as possible, that they provide all the information their users require for the various uses to which they are put, and that the process of turning reports from observers into validated information be as smooth and efficient as possible. BLAST will demonstrate the following features as steps to this goal:

Single-window, harmonised reporting: At present, reporting discrepancies in nautical publications and charts and problems with navigation aids requires mariners, other observers, and potential sources of this information to know where and how reports should be sent and what data the publishers of maritime information need as part of the report in order to process it in the most efficient manner. These details vary from country to country. The concept of single-window reporting is already being applied in different government interactions with commerce and the public. In maritime commerce, it is being applied to the different kinds of reports ships are required to file in connection with port arrival, security, customs, and cargo. The MDCS project in BLAST will apply the single-window concept on a trans-national basis to the problem of gathering the information needed to keep charts and nautical publication as up to date as possible.

Encouragement of reporting: Mariners are conscientious about reporting information which affects safety, and coastal agencies and hydrographic offices encourage the reporting of safety-related information. Nevertheless, some information such as plans for construction in ports may either not be reported at all or not reported in a timely manner. Providing an easy-to-use method makes it easier for publishers to request and for sources to supply all the different kinds of information that publishers would like to receive.

Facilitation of reporting in appropriate formats: The publishers sometimes have requirements for information content, metadata, and data quality that may not be known to potential reporters and which may not even be obvious. Making such requirements known to potential reporters and encouraging compliance with the requirements and completeness of information as part of the process of reporting will make it easier to process the information that is provided.

More and quicker feedback on the status and disposition of reports: Providing feedback to reporters on the status and disposition of reports fills a stated need of some reporters. Publishers also have policies about acknowledging reports. Both needs are satisfied with a

minimum of effort if reports can be tracked by the persons filing them and the status and disposition of reports, and any follow-up queries, can be made available.

Better information flow between and within agency offices: The processing of a single event often requires responses of different kinds from different offices and agencies or the involvement of higher authorities. A more efficient flow management will make it easier for the responsible offices to know what action is expected of them and when, and whether and what action expected of other offices has been completed.

Facilitation of more "on-demand" publications: Finally, the quicker and more efficient processing of new information that is facilitated by this BLAST project will make the production of up-to-date on-demand publications a better deal for users of this information, especially since it reduces the chore of keeping on-board publications and charts in synchronisation with the latest corrections and updates.

What future mariners are thinking

In teaching and discussing with young cadets at Chalmers maritime academy in Sweden, one of the authors of this report has come to realise that the new IT-generation of bridge officers do not regard the ECDIS as just a chart display system, but instead more like any computer, just one that displays a chart. They expect all information to be present with a right click in the chart - the relevant information for their type of ship and draught, with their cargo and destination and at their specific position. They cannot understand why they have to look for general information in maybe outdated books. They wonder why they cannot just search for it with a search engine such as Google™.

When cautioned about the possible dangers of cluttering the chart display with all kinds of information windows, they say "all right, give us a planning station at the back bridge, make it a paper-chart-size multi-touch screen table that the navigation crew can all gather around during planning and briefings. This is the environment where the right click access to all the information that we now have to hunt down in books and paper publications is needed."

How will the nautical information community respond to such suggestions? Are we ready to continue on this way new and better decision support solutions, powered by a new generation of nautical information? The aim of projects such as BLAST is to allow all sectors of the North Sea maritime community to get involved in answering these questions.

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