ACCSEAS Annual Conference 2013 Report

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1 Introduction

The first ACCSEAS Annual Conference was held at the Flensburg University of Applied Sciences, Germany on 5th – 7th March 2013. This report summarises the discussions and conclusions of the Conference.

Presentations and videos of the presentations are available on the ACCSEAS website (www.accseas.eu), and should be consulted with reference to the summaries given below.

2 Day 1

The first day was concerned with introducing the project and disseminating results from the project.

2.1 Welcome to the Conference, Mr. Roger Lockwood

Roger Lockwood provided the opening address to the conference, and welcomed everyone to first ACCSEAS Annual Conference. The ACCSEAS project was briefly introduced as an EU INTERREG IVB North Sea Regional Programme (NSRP) by the European Regional Development Fund (ERDF). The spirit of the Conference is to co-operate transnationally, and he emphasised the importance of exchanging ideas and of two-way communication during the event.

2.2 Welcome to Flensburg University of Applied Sciences, Prof. Dr. Zickfeld

Prof. Dr. Zickfeld welcomed the delegates to the conference. Shipping in the North Sea Region (NSR) is challenging, and there are a number of factors to the safe navigation in the NSR. The University has simulators which will show how important education and training are to the modern mariner. There is a clear need for a reliable view of the NSR by 2020. The number of ship movements is very likely to increase, and there is a need to differentiate between different users. Multi-system position systems are of particular importance because of the reduction in sea space due to off-shore developments.

2.3 Welcome to the City of Flensburg, Lord Mayor Simon Faber

Mr. Simon Faber welcomed all the participants to the City of Flensburg. He identified that Flensburg is a good place to see the link between the Baltic Sea and the North Sea through the Kiel Canal and the Skagerrak. Flensburg has been the centre of transnational co-operation, with Denmark and Germany working more closely than ever before. Nations have to come together to communicate, to co-operate and to work together, and Flensburg is a good venue to do this with its historical backdrop. Flensburg became the second biggest exporter in the Danish state due to the export of Flensburg Rum. The original architecture exists in the City. The Flensburg shipyard was established during the Industrialisation period, and it still operating and competing well around the world. The Mayor wished the project and the delegates every success in tackling the challenges of shipping in the NSR.

2.4 Introduction to the Conference, Prof. Jens Froese

Prof. Froese raised the issue of the phrase "safe and efficient" access to the North Sea. There cannot be a worse impact on an economy than an accident. Safety is an inherent part of efficiency, but it is recognised that a safe system can be inefficient. Safety must also include sustainability. In the past, when mariners saw land it made them concerned, but in modern times, landfall can be relaxing to the mariner: there are marked channels and pilots, and no off-shore developments. e-Navigation addresses safe berth-to-berth navigation, but the delegates should include the whole logistic chain. Logistics is the reason we do ship navigation. The key datum in this is the Estimated Time of Arrival (ETA). Prof. Froese urged

investigation of how to reduce the difference between ETA and actual time of arrival. He encouraged everyone to collect and discuss ideas, feed the discussions and help the conference come a good conclusion and send a message to the policy makers.

2.5   Introduction to ACCSEAS, Dr. Alwyn Williams

Dr. Williams provided an overview of the objectives of the ACCSEAS project, and put the aims of the Conference into context. After showing the project video, Dr Williams went on to describe the project in more detail, explaining that the project is to design and implement an e-Navigation test-bed with a focus on Resilient PNT and e-Navigation services. This will be done using the IMO's overarching architecture as the foundation of the test-bed. The Annual Conference provides the delegates to see what has been going on, and how they can have their say in what has been discovered.

2.6   Introduction to e-Navigation, Mr. Pieter Paap

Mr Paap gave an overview of e-Navigation and its aims.

In 2004, IMO oversaw the developments in maritime domain. There were larger, faster vessels, reduced crews, and combined with accidents and incidents, meant issues needed to be resolved. The profile of shipping was changing and navigation expertise was fading away. There were also many legacy legislations, and apparent issues with training on board.

In 2006, IMO formed the worldwide strategy for the e-Navigation concept. The "e" was clarified to mean "enhanced". The strategy was developed by a number of sub-committees in IMO, and was approved by the Maritime Safety Committee in 2006. IMO began the e-Navigation Correspondence Group, chaired by Norway, to capture the issues of implementation and to develop the Strategic Implementation Plan. In 2014, the Strategic Implementation Plan is planned to be approved, and the implementation process will start in earnest. However, e-Navigation is a continuous development process, and it does not stop. It is recognised that IMO can't do it alone, and will require the co-operation from CIRM, IALA and ISO, for example.

The aims are to promote worldwide standardisation, uniformity and interoperability of the technical equipment, and system integration, driven by user needs. It will also support safe and secure navigation, including monitoring, communication and data exchange. It will contribute to efficient maritime transport and logistics, as well as effective search and rescue operations. It will continue to develop requirements for training and education.

At the core of e-Navigation are certain elements: architecture, human factors, uniformity of standards, GNSS and PNT, communications and information, electronic nautical charts, and standardisation. It is emphasised that e-Navigation is user driven. It is recognised that e-Navigation is a combination of old and new technologies, which should be scalable.

The IMO defined e-Navigation as: "the harmonised collection, integration, exchange, presentation and analysis of maritime information onboard and ashore by electronic means to enhance berth to berth navigation and related services, for safety and security at sea and protection of the marine environment".

Information is provided in a modular way to a central "processor", and distributed to relevant users using common, standardised formats. This will assist with additional services, particularly with the logistics chain.

Who are the users of e-Navigation? At sea, they are both the SOLAS and non-SOLAS vessels. Non-SOLAS vessels traditionally take advantage of the technology developed for SOLAS vessels. On the shore side, the users are, for example, VTS centres, ship-owners, terminals and enforcement agencies like border control.

2.7   Introduction to e-Navigation and the NSR Perspective, Mr. Christian Forst

Accessibility is a general term, and usually means the easy reaching of destinations, although what it actually means is being disputed. We recognise that international trade is very old, and that safe and efficient global trade has social and economic consequence. Global trade is developing and it is depending on a worldwide maritime transportation system. Transportation causes traffic, and traffic is going to increase. However, everyone expects the transport of goods and people to be done in a safe, efficient and secure way.

The key to this is safe, efficient and easy access to ports - it is essential for global trade, and important economic factor for many nations. Good examples of these in Germany are the approaches to the Elbe, Bremerhaven and the Kiel Canal which need safe and easy access to the waterways. The need of e-Navigation should support the entire logistical chain. The accessibility of the ports is essential, not just domestically, but for the whole of the EU. Marine Spatial Planning (MSP) shows that existing clear seaspaces will be given over to wind farms. MSP has to take into account many factors and many stakeholders. One of the issues is the good accessibility for shipping. This is shown in the ACCSEAS project so far. IALA has shown to be strongly supporting international co-ordination. International co-ordination has good history in the NSR, for example, between UK and France in Dover Strait. Based on experience, there is an increase in shipping traffic, and transnational co-operation is critical to deal with this. Good transnational co-operation requires a good understanding of the processes involved and the exchange of all relevant information.

The e-Navigation concept will assist safe and efficient shipping in the NSR. There are many stakeholders, and they all share a common interest – the maritime space, and they contribute to the Maritime Service Portfolios (MSPs). IMO's comprehensive and challenging concept is capable of assisting the transnational co-operation, and as such will be of benefit to the NSR through ACCSEAS. Shore-based services will be enhanced, especially using S-100 data standard. Potential NSR MSPs will be defined in the ACCSEAS project, and involving relevant external stakeholders. ACCSEAS is a challenging and exciting project that provides a perfect platform for providing the test-bed for testing the innovative services transnationally.

2.7.1   Post-presentation Discussion

Is Marine Spatial Planning a part of ACCSEAS? The ACCSEAS project does not include MSP explicitly, but is a tool that allows the mariner to navigate areas where MSP is implemented. It was further clarified that the topic of MSP may be more appropriate by policy makers, and not within the ACCSEAS project.

In a recent MSP meeting, fisheries and wind farms were deemed very important, but marine navigation was low down the list. This has caused concern, and it is hoped that ACCSEAS can raise the profile of maritime safety within MSP.

2.8   Accessibility to NSR Ports, Capt. Ben van Scherpenzeel

The presentation started by asking why is it so difficult to obtain port information? A number of publications exist, and they all tell a different story about the same port. The master is given the difficult task of determining what is the best source of information. A project was developed called "Port Information Project" to begin to resolve these issues by trying to harmonise the information between publications. It dealt with the harmonisation of information for the whole port (e.g. reporting issues, contact details, VHF channels, etc).

The project was recognised by the Oil Companies International Marine Forum (OCIMF) as a good means of distributing port information. However, it was not enough, as the organisations required the berthing information at the destination before loading at the departure port. The information was harmonised in terms of the information given and its

format (including photo/charts). It took from 2007 until 2009 for all the parties to be happy with the format.

The project was approached by UKHO who were happy with the formats, but recognised that they were in Excel or Word format used for testing purposes. The suggestion was for it to be made available on the internet. This developed into Access to Validated Nautical Information (AVANTI), and all ports have access to provide information in a harmonised way.

There is a concern that each role in port (master on the ship, the agent, the port operators) do not know what the other is doing. A video was produced to educate everyone involved in port operations to understand each other's role. These were made available to the Conference delegates.

In moving forward, one port has filled 100% of the information, with two other different types of ports invited to do so. After this trial phase, an industrial version will be rolled out.

During the voyage, the mariner is updating the Estimated Time of Arrival (ETA), but he has no idea of the situation at the terminal (i.e. his destination). The pilot service is dependant on the departure time of the vessel currently at the terminal, and a vessel approaching the port needs to know when the pilot will be available for him/her. The departure time of the vessel in port is dependant on a number of services in the port, and leads to an unpredictable departure time, which in turn leads to an unpredictable arrival time at the pilot station for incoming vessels. In 2013, there needs to be a harmonised agreement on what is meant by arrival and departure times.

When discussing MSP, it should be borne in mind that IMO have rules and regulations regarding the planning of obstructions in the sea through IMO's General Provisions on Ships' Routing. If the master of a vessel is responsible for the ship, and shore-based authorities have not allowed enough room to deviate course, then there is potentially something wrong with the situation. Planners need to respect the fact that mariners need the sea space to be able to safely manoeuvre.

2.8.1   Post-presentation Discussion

There is an apparent belief that 1nm is enough space between a shipping lane and an obstruction (such as an off-shore wind farm). However, it is clear that mariners must have enough room to be able to perform an escape turn, and even then must not come within 500m of the off-shore structure. It is possible that the policy makers at national level involved in MSP are not aware of the issues regarding the COLREGS.

It was noted that the accuracy of the ETA is largely down to the capability and experience of the master of the vessel.

There is a perception that the space given to vessels within wind farm areas is enough. However, simulators show that the space allocated to shipping channels is tight, especially if manoeuvres have to take place within those channels.

IALA is intending to hold an exploratory meeting to discuss MSP issues and how collaboration between organisations can take place. The meeting will take place 8-9 April, and any interested parties can contact the IALA Secretariat for more information.

The issue is not just with navigation space, but with shipping density too, and this needs to be brought to the attention of the wind farm planners. The channels marked for vessels are potentially congested because smaller craft must not impede vessels travelling along the Traffic Separation Schemes (TSS), so they sail in the areas designed for emergency manoeuvring. The rules of the COLREGS are often needed to be explained to planners so they understand the requirements.

2.9   Challenges of the North Sea (with Discussion), Dr. Thomas Porathe

Dr. Porathe introduced Work Package 3 of the ACCSEAS Project, and one of its objectives is to determine the baseline and the priorities of shipping challenges of the NSR. The project has a Geographic Information System and examples of the data it holds were shown.

It was noted that the North Sea is very shallow, and much of it is less then 50 metres deep. For example, the Dogger Bank is 13m in the shallowest parts.

The vessel density plots for the NSR were produced by the Danish Maritime Authority (DMA – ACCSEAS project partner), and the shipping lanes are very visible. From the traffic numbers from 2012, 131000 vessels passed through the Dover Strait, and 54000 passing by the Skagerrak. The busy areas of the NSR were defined as greater than 400 vessels within 1.5' square cell (approx. 2.8 x 1.4km), producing a contour that can be plotted on the map that includes oil/gas platforms and other obstructions. There does appear to be a correlation between shipping density and the accident/incident data from EMSA which shows particularly high accident figures to the south of the NSR.

IALA's tool that has been developed to evaluate the risk of vessels colliding or grounding (known as 'IWRAP') can be used to determine the risk to shipping using a theoretical analysis of the shipping data. Statistics can be produced on the shipping routes, and the IWRAP analysis shows the areas of higher risk in the NSR. For example, the statistics show there is a chance of an accident once every four years in the Netherlands' area. This seems to correlate well with real data. For example, the Baltic Ace incident happened in this area. Dr. Porathe thinks this is a typical human error situation, although it is acknowledged that the cause has yet to be officially determined.

Despite the economic crisis, we probably will have more vessels in the NSR. Dr. Porathe showed the planned wind farm areas, and some are encroaching on shipping lanes:

> Germany, for example, has generated a good plan of where the vessels can sail amongst "windmill city". However, there are potential problems, particularly if the weather deteriorates.

> Another example illustrated a ferry from Zeebrugge to Hull, which has to change its route due to a new wind farm, potentially confusing the other mariners about its intention.

> The UK "East Anglia" wind farm has routes within it for vessels, but it could still cause a high density of ships to squeeze in through tight lanes.

> The Netherlands has already moved shipping lanes, and the wind farm has had to move due to the requirement for more space between the shipping lane and the turbines. This could be deemed a good example of the maritime safety interest taking precedence over wind farm requirements.

Different type of maritime space was identified: nature and habitat reserves, wind energy, wave energy, aqua culture. There are open questions on whether spaces that are currently open to shipping will be given over to these uses, particularly with regard to energy extraction.

What are the problems and solutions for the future?

A key element is Marine Spatial Planning (MSP). The shipping industry must join in the MSP negotiations as there is a need to share the space, and to co-operate in a rational way. One possible way forward is to identify a network of shipping routes, that can be used as a starting point with MSP discussions. Australia has already tried to do this, and it seems to work, but accident statistics are not available. Possible other solutions (building on IMO) are: multi-source positioning, route exchange, augmented reality HUDs, mariners Notification Service, Maritime Service Portfolios, Dynamic Under Keel Clearance ('NoGo' areas).

A question remains on what impact the new Arctic routes will have on vessels navigating and coming through the NSR.

2.9.1 Post-Presentation Discussion

The issue of co-ordinating shipping lanes was raised, and it seems the problem is that the discussions between member states tend to be bi-lateral discussions, and not region-wide co-operation.

There was pressure on using renewable energy, particularly after the Fukushima accident in Japan. It was noted that Wasser und Schifffahrtsverwaltung des Bundes (WSV) have done well to protect the interests of shipping in wind farm developments in Germany.

There was a concern expressed that shipping interests may not be adequately supported at EU level. This may be a perception issue, but if that is the case, how can this be improved? The development of wind farms is carried out in places where the water depths is less than 70 metres, and given the high costs of underwater cable and the support network, the wind farms are placed in the areas of high shipping density.

The conflicts in MSP are growing, and the discussions do include the mariners, but there needs to be harmonisation of processes.

Who are the MSP planners? They vary from the local level, to the regional level, to the national level, but it depends on the topic. Is there a risk of a disconnect because the right organisations are not being contacted?

The competent authorities are always responsible for the MSP in their national space. The best way may be to use a regional approach to MSP, and not necessarily a EU-wide approach. There is no list of criteria as to what MSP actually is, or at least not one that is harmonised worldwide. The IMO guidelines should at least be referred to when considering Marine Spatial Planning.

2.10 Simulators of the University, Capt. Gerald Immens

Capt. Immens introduced the wind farm developments in Germany, and highlighted the issues of sailing within the corridors provided for shipping. The FUAS' six full mission simulators have been able to simulate vessels sailing in this area. To achieve this, a very sophisticated model of the wind turbines, including the rotation of the blades with the wind speed/direction was developed, and applied to the planned developments.

The simulators have fully functional ECDIS and radar, and are an ideal training aid for the mariner in a safe environment. It's possible, for example, to make the radar picture worse, to show the problems that can happen on the bridge of a real ship.

The issue of crossing shipping traffic was researched by FUAS, and how mariners cope with the situation. Studies show that when the mariner moved out of the way for other vessels, they did not move back onto their original track. Interestingly, the studies also showed they only used one piece of equipment to navigate by. This work is subject to further research, including navigating at night.

3 Day 2

3.1 Negotiations of user interests in Maritime Spatial Planning in the NSR to maintain Accessibility, Dr. Nico Nolte

The perception is that the sea is in an open space, but this is not the case. There are many activities that use the sea space: traffic separation schemes, shipping, fishing, as well as pipelines and cables.

New users of the sea are the offshore wind farms. The developments are not happening in a vacuum, and there are many political motivations. For example, targets for nature conservation (Natura 2000) or energy production set the background for Maritime Spatial Planning. Germany is predicted to need approximately 5000 to 8000 turbines, producing 25000MW, to help to meet the target of 35% of the electricity supply from renewable energy by 2020. It is anticipated that 15% of the German Exclusive Economic Zone (EEZ) will be covered by offshore wind farms with 100 wind energy projects. Several wind farms are already under construction, or operating, and many underwater cables are required that cross the Wadden Sea National Park.

It is clear that there are multitudes of users of the sea, and they cause potential conflicts between uses and users of the marine environment. There are similar issues in the Baltic Sea too. MSP can be a supporting tool and process for cross-sector co-ordination of the sea space in an intelligent way, by balancing interests. There is a need for such a long-term, sustainable and prudent planning of the sea space.

Nations are allowed to use the EEZ out to 200nm for planning purposes, even if it is outside of the 12nm territorial waters limit. There is full MSP jurisdiction in the Territorial Sea area, and limited MSP jurisdiction within the EEZ (max. 200nm), taking into account the co-ordination of rights of Article 56 of UNCLOS. Within the EEZ, there is freedom of navigation for all states, and there can be no unilateral definition of sea lanes for international navigation (this falls under the competence of IMO). The German EEZ has been planned within the framework of UNCLOS, and any planning must respect the freedoms in the EEZ.

In Germany, guidelines were formulated for MSP in their EEZ. Questionnaires were sent out to users of the sea area to determine what activities were taking part and where. There was also international consultation with neighbouring countries. AIS was used to determine where marine traffic go, which clearly showed where the major traffic routes were. The traffic lanes were defined, with buffer and priority areas for vessels.

For the first time, a large scale Strategic Environmental Assessment had been carried out in a sea area distant from the coast. Private and public sources were used to support projects to bring together information on the marine environment.

Wind farm areas have been prioritised, and 10000MW have been approved. This is short of the 25000MW requirement by the German Government, so additional areas have been approved since the original plan set in 2009. 30% of the area is defined as Natura 2000, and therefore, no turbines will be erected in those areas.

International co-operation on MSP is working and organised. For the NSR: OSPAR Intercessional Correspondence Group on MSP is working on these issues. In the EU, DG MARE Expert Group on MSP will shortly publish a draft directive on MSP and Integrated Coastal Management.

For information, details of an MSP project in the Baltic Sea can be seen here: http://www.baltseaplan.eu/.

3.1.1   Post-presentation Discussions

If Traffic Separation Schemes (TSS) are in the EEZ, then they should be designed in-line with IMO guidelines. Dr. Nolte agreed and pointed to a good example of transnational co-operation, where size of the buffer zone was agreed at 2nm plus 500m safety zone.

What happens in the 12nm? The same principle and methodology applies, but tourism plays is a much bigger factor, and forced the wind farms out further out to sea.

In the opinion of some mariners, the solution found in the German system looks like a compromise and the compromise may 'give rise to dangerous situations'. Dr. Nolte referred to advice given by the experts who determined that 2nm and 500 metres for the buffer zones presented an acceptable level of risk.

3.2   e-Navigation and EU Policy, Mr. Richard Hill

There are key shared EU and IMO goals with respect to e-Navigation. These are safety and security at sea, and protection of the marine environment. More specifically, it also allows vessel traffic observation and management, contingency response and search and rescue operations.

The key maritime safety elements of EU policy have been in response to a number of incidents such as the Brear, MS Estonia and the Prestige. There are three EU Maritime Safety Packages: Erika I, Erika II and the 3rd Maritime Safety Package (2009-2012). There are links between these packages and e-Navigation, in particular with regards to AIS, Vessel Traffic Monitoring, Oil Spill Response and Long Range Identification and Tracking (LRIT). It was noted that the 3rd Maritime Safety Package is largely finished.

These packages were based on pollution risk and damage, and the types of incidents are changing to navigational errors and collisions. Does e-Navigation solve these, and what is the link to EU policy? Potential areas for a 4th Maritime Safety Package could be compulsory pilotage areas, vessel routing, anchorages, and integration with MSP. e-Navigation has the potential to be involved in all of these areas.

The area that e-Navigation has closest links to EU policy is with Marine Environmental Protection, since it has the potential to reduce the risk through improved navigational safety, reducing emissions by optimising routes, and potentially to assist with the response to oil spills by making cargo information available. The Marine Strategy Framework Directive has the objective to achieve Good Environmental Status across the EU by 2020, and as such, utilises the Natura 2000 network and links to the Maritime Transport Policy and the Ports Policy. There is a clear link to e-Navigation in that respect.

e-Navigation can help Marine Protection Areas (MPA) by routing vessels to avoid collisions and grounding risk, taking into account seasonal sensitivity, marine mammal and seabird migration or breeding seasons. In a recent ACCSEAS meeting, it was identified that there may be a need for bigger anchorage areas due to larger vessels not being able to enter the port in bad weather. This could have an impact on nearby MPA too. e-Navigation can help focus the attention of operations of oil spill response and search and rescue as more detailed information will be available. It may even be possible to identify vessels that cause pollution that cannot be identified using currently available technology.

There appears to be a key link into EU policy for e-Navigation in the EU Integrated Marine Policy through blue growth ("highlight synergies between sectoral policies"), Marine Data and Knowledge ("providing industry and public authorities with data"), Maritime Spatial Planning ("marine space and resources are used efficiently and sustainably"), and Integrated Marine Surveillance (with possible links to the Common Information Sharing Environment). The presented "circle of e-Navigation" taken from the Monalisa project could be a good start for harmonising the EU policies on e-Navigation.

It was also identified that there is a similarity of objectives between the EU Framework document on MSP, COM(2010) 771, and the output of IMO NAV54 on the strategy for e-Navigation. In particular, the needs for environmental impact analysis, hazard/risk assessment, risk mitigation, preparedness and resource management. This is an area that ACCSEAS can have an impact on. COM(2010) 771 also identifies that all stakeholders should be involved in the MSP process, and not limited to policy makers. An example of MSP and shipping working together was shown from the Boston area in the US where a shipping route was changed due to whales.

There may be an opportunity to set up a framework and joint co-ordination of maritime safety policy as a part of ACCSEAS.

3.3 How architectural elements of e-Navigation may assist in maintaining accessibility in the NSR, Mr. Jan-Hendrik Oltmann

The presentation concentrated on the Maritime Services Portfolios (MSP) for the NSR, based on the IMO e-Navigation architecture. The services and where to apply them needed to be determined, and also the Route Topology Model (RTM) would be introduced.

The various elements of the concept were described briefly, and the importance of the services, PNT and the Common Maritime Data Structure were highlighted.

Viewing the concept from a different angle, there are the seven pillars of e-Navigation, mounted on top of the foundation laid down by IMO. The Common Maritime Data Structure would be the glue between the difference elements of the concept to ensure that all services can talk to each other.

A spectrum of operational services (VTS, SAR, Pilotage) and spectrum of technical services (Radar, AIS, Communications, Radio Direction Finding, ENC Updates) are defined. It is clear that there are dependencies between the two spectra. All services (existing and new) would be identified, named and recognised internationally. Also, the dependencies between the two spectra need to be understood as well as who is responsible for it.

Moving from theory to practice, it is recognised that the Canadian Coast Guard (CCG) have done this, and the example shows how they have mapped Maritime Service Portfolios against the Coverage Areas. CCG defined geographic areas, regardless of the shipping traffic in those areas. Is it possible to define the coverage areas based on shipping traffic? It is possible if the traffic routes are known, which leads to the RTM and that each "leg" of the model can have services attached to it.

What is the RTM? It consists of three elements: leg, junction, node (e.g. port). Attributes are attached to each element, for example: physical attributes (location, width, length), traffic related attributes (direction, density), or services provided (Maritime Service Portfolio). The information about the RTM is based on the IHO S-100 methodology.

A basic example of the RTM around the German coast was presented, and it showed that it is similar in concept to the "London Tube Map".

There are pre-cursors to the RTM, for example, the TEN-T programme for the Motorways of the Seas. It was noted there is recognition that traffic in the NSR needs to be better understood, but there is currently no route network through the region that includes everything.

In ACCSEAS, the density map of the NSR was investigated and the initial version of the RTM was shown. A version with traffic directions was included, as well as locations of potential wind farms. The RTM is based on where the higher density of shipping are sailing, and a detailed example around the Dutch coast was shown.

The RTM is a description tool and allows the routes and features of the region to be captured in a consistent way. An IWRAP result for the ACCSEAS NSR RTM has been produced shows the level of risk for the routes in the region.

The RTM can broken down further. Expanding the term Motorways of the Sea, there is the possibility of "roads of the sea" or even smaller routes for small/pleasure crafts. The RTM is also a planning tool that allow the future situation to be captured.

The ACCSEAS project will further develop generic description of the RTM, create the RTM for present and future situation, develop the MSPo for the region and apply them to the RTM.

3.4 Maritime Information Services in e-Navigation and ACCSEAS, Mr. Mads Bentzen

The presentation concentrated on solutions envisaged to be a part of the ACCSEAS project, and how they link to the IMO e-Navigation concept.

The present focus of ACCSEAS is the Mariners Notification Service which includes Maritime Safety Information (MSI) and Notice to Mariners (NM). When a notification is received, the mariner needs to quickly know where it is, and what it is, especially as the mariner is busy with other systems on the bridge of a ship. An example of a visual demonstration of the MSI was shown – a hatched areas show the area affected by the MSI.

Another example is inoperative AtoNs, which can be made to appear on the ECDIS. The system is taking out the relevant information from the broadcast, and placing it on the electronic chart. It has been recognised that information is difficult to transfer between organisations, even when they reside in the same country,

One idea is to share data using a web interface, transferring information to the vessel via various different communications methods, e.g. NAVTEX, AIS and e-Navigation communication.

Another information service being considered is the sharing of intended routes, where routes are electronically distributed between vessels. The vessels can see each other's way points, and avoid collision.

Another potential service is the Dynamic Under Keel Clearance Service (also known as no-go areas). Taking into account tidal information and bathymetry data calculated on shore, it is possible to tell a vessel where it can and cannot go before grounding.

Finally, the Vessel Operation Coordination Tool (VOCT) was shown. Its primary purpose is to help those involved in Search and Rescue (SaR) operations. This was tested with Chalmers University of Technology with eight Navy vessels. A simulation ran in parallel. The electronic version took 30 seconds to transfer five waypoints and details of the area to investigate to the vessels. In reality, it took 14 minutes to do the same using traditional techniques. Search patterns are normally calculated on board, and there is a lot of information. To help with this, the "eraser" track that takes into account the eye height and conditions determines which areas have already been checked, thus making the SaR operation more efficient.

More work is required, but hopefully the ideas being presented will aid safe navigation in the NSR.

3.4.1 Post-presentation Discussion

The information being presented will be an ECDIS overlay. Is there a procedure to remove the overlay afterwards? This technique is being updated, and will include "valid from" and "valid to" time information. It is clearly important to make sure that the old information is removed.

Is there an audible/visual alarm when a notification comes through? Yes, there can be. Various sophisticated filtering systems are being developed so that only relevant notifications will alarm on the bridge (e.g. only messages within 20nm of the route cause an alarm). It was also noted that the messages are acknowledged by the mariner as well.

IALA recognised that both this and the previous presentation showed that communications are vital. IALA is making work on the VHF data communications, and it has the potential to form an important part of e-Navigation. ACCSEAS is recommended to feed back into IALA in order to harmonise data exchange formats

Is it possible to manually add a "no-go area" on the ECDIS? It was suggested that the Costa Concordia incident might not have happened if the rock was marked on the chart in this way.

Mr. Bentzen noted the point, but added that work is mainly on the dynamic calculation of the no-go areas.

A concern was raised regarding the symbology for the navigation warnings and that the mariner would have to continuously click on the warning to get information, and so it might get disregarded. It is recognised that there are many navigation warnings that do not have symbols, such as a lighthouse that has no light (but the lighthouse symbol is still there). It is acknowledged more work is needed here.

Regarding the SAR tools presented, were the effects of drifts on the geometry of the search patterns considered? This is being considered by moving the datum to allow the search partner to drift with the weather or tide.

Can drift be plotted? Yes, this can be transmitted to the mariner. In the MSI, it could be possible to include the container drift patterns to the mariner. This was done a few years ago in Denmark, although there can be an issue with keeping it accurate.

3.5 Resilient PNT and a Critical Asset for all e-Navigation Solutions, Dr. Paul Williams

Shipping density will increase in the next few years, and there are recognised potential issues in the NSR. Within that environment, GPS has become the de facto standard for navigation in the NSR. GPS is also being linked to the various systems on the vessel which the mariner uses to navigate with.

However, GPS is vulnerable. For example, GPS took nearly three hours to warn mariners' receivers that there was a problem with a satellite, and there are a number of examples of unintentional jamming of GPS failure. All this happened with no warning. The issue of jammers is a real threat. A cheap jammer can block GPS 30km out at sea. A similar jammer would cover the entire Dover Strait.

IMO says that e-Navigation systems should be resilient, robust, reliable and dependable. Using different GNSS is not enough because they all use the same principles and frequencies.

There are many potential solutions being discussed in the ACCSEAS project, all of which rely on resilient PNT. There are various options for resilient PNT: Inertial technologies, Hardened GNSS, Enhanced Aids to Navigation (synchronised lights), R-Mode (DGPS & AIS) or eLoran. The cost-benefit analysis needs to be carried out for each system that can provide the service required.

In ACCEAS, whatever form the resilient PNT takes, the IMO architecture will be the basis of the system, and would be PNT system that does not rely on GNSS.

Three candidate systems are going to be investigated:

- R-Mode (range mode): adding a ranging signal to the existing DGNSS radiobeacons, which will require modification. Possible to do this for AIS too, but the system requires line of sight, so is shorter in range.

- eLoran: Uses a similar concept to GNSS, but uses low frequency signals from terrestrial transmitters. To obtain the requirement technical preference, a dLoran system is required that determines the corrections to the mariner using internet based services. The existing system can provide accuracies better than 10m in the NSR. It has been implemented in Port of Rotterdam and Dover Strait. The system will achieve Initial Operating Capacity in 2014 and covers seven major ports. It is planned to achieve Final Operating Capacity in 2019.

- Radar absolute positioning: Using New Technology Radar requires active radar transponders. A trial is planned, but unlikely to be fully tested by the end of the ACCSEAS project.

The prototype PNT data processor is being worked on by the GLA with other partners. This was demonstrated in Harwich, using GPS, eLoran and the data processor. A trial was developed to demonstrate what happens when the GPS is jammed on a vessel. It computes positions and provides integrity warnings. Two phases were run with the prototype system disabled and then enabled. All systems with GPS failed in the first run. For the first time, a prototype PNT data processor supplied the bridge system with resilient PNT data served from eLoran. A DVD and a short video will be available at www.gla-rrnav.org.

How does this fit into e-Navigation? It does so through the Multi-Source Positioning Service (MSPS). It uses multiple sources of PNT including terrestrial backup system to GNSS. MSPS is a critical service for safety and efficiency of shipping.

MSPS requires associated service attributes to define the geographic coverage and service level performance for different parts of the coverage areas and legs of the RTM. MSPS service level must recognise the requirement for its portrayal too. It should raise an integrity alert whenever the Horizontal Protection limit is exceed to avoid presentation of hazardously misleading information.

The next step is to consider a complete feasibility study for R-mode DGNSS, and decide which radiobeacons will be modified, taking into account the propagation corrections and the need for differential reference stations. For eLoran, the next step is to determine where to measure corrections in candidate port location and approaches. There is also a need to complete the radar positioning trial.

3.6 Introduction to the NSR e-Navigation Forum, Mr. Pieter Paap and Mr. Richard Hill

Mr Paap introduced the e-Navigation Forum to the audience which will be an organisational legacy of the ACCSEAS.

The format will be a combined two-day annual conference for the NSR e-Navigation User Forum. The workshops will be carried out on the second day of the conference. This is true for the present conference and in 2014. In 2015, the conference/forum will offer workshops on the output of the project. The conference is focused on the region, and is not a worldwide conference. ACCSEAS should be publicly disseminating information of its findings and be open to all. The second annual conference is in Edinburgh, and in 2015 it will be held in Rotterdam.

The relationship of the various groups of the project was described. The Service Providers Co-ordination Group (SPCG) is for anyone that provides a service: authorities or industry. (including ENC makers). Each project Work Package (WP) has Vertical Integration Workshops (VIEWs) to gather input. There are likely to need decisions that are outside the remit of the partners in the project, and so the Transnational Advice and Guidance Group (TAGG) can bring in policy makers into the project to give advice. The ACCSEAS Annual Conference has all the invitees of the conference of the groups above, including international organisations.

After the project, the TAGG, SPCG and the e-Navigation Forum will continue as a legacy of the project. The results are going to be brought together in to develop the Sustainability Workplan 2020+, identifying future work, roadmap for service expansion, plan for the sustainability and harmonisation of e-Navigation in the NSR.

The key part of the project is that it feeds into EU interventions so that EU policy is advised from the ground up. The groups developed during the project are an important part of developing those links to EU policy.

3.7   Presentation and Discussion of the Workshop Results

3.7.1   Workshop 1: NSR Accessibility Issues (Routes and Ports)

Workshop 1, facilitated by Richard Hill, was based on the previous workshop held in Amsterdam in December 2012, identifying areas of congestion in the NSR today, navigation issues and potential solutions.

3.7.1.1   Summary of Workshop 1 outputs

Are there areas of the NSR associated with congestion and navigation accident risk today?

Potential pinchpoints included entrances to all NSR major ports, including Rotterdam and the Kiel Canal and River Elbe approach to Hamburg. Weather and **tidal conditions** and **ship size** are **important factors** related to **increasing the waiting time of vessels entering port** and creating congestion in constricted holding areas. A possible solution to mitigate this would be the **use of pre-arrival information** to manage in and out-bound traffic **to manage the coordinated times of arrival** of vessels.

There is an issue of **port services** and their resources being a limiting factor, such as the **limited number of tugs and pilots**. This is a new issue not identified at previous workshops. A balance between increasing port service resources and the widening of channels may be an approach to solutions needing further investigation.

Seasonality causes, including variable weather due to **climate change**, can also present port accessibility issues. For example, prevailing winds seem to be changing over time due to climate change. There is a seasonality factor regarding **small crafts' conflicts with larger vessels**, with a lack of knowledge amongst some Masters of smaller craft and lack of experience with equipment. The seasons seem to be extending, and therefore more small craft conflicts could arise.

What are the implications of increase density of shipping, the growth of offshore installations and the development of larger less manoeuvrable vessels?

Debatably, larger vessels are not necessarily less manoeuvrable, so this may not be a major issue. However, **port infrastructure is an issue for larger vessels**, especially with regards to width and depth of channels into and out of ports.

Wind farm installations offshore perform **risk assessments** to assess an **acceptable level of risk** of vessel collisions with turbines. Germany uses a risk assessment model (1 in 100 years) as a review of an acceptable risk of accidents, but wider use across the NSR would need to be investigated. The future use of an **environmental assessment model** may be helpful, in association with the evaluation of risk mitigation due to e-Navigation services.

What are the associated risks, such as grounding or collision?

The Forum considered **who pays for emergency towage** and tugs? The principle was debated that responsibility for the cost should lie with those causing the problem. So should

the wind farm developer pay? It is not always clear where responsibility lies – an example of a ship with an engine failure and drifting into a turbine was cited. But some member states have the concept that the developer should pay if the installation can be shown not to meet the acceptable risk level of 1 in 100 years.

How can safe and efficient access to ports be maintained?

The key to this safe and efficient accessibility was considered to be the recognition of the **value of marine resources**, including open sea space. We need to understand how we value the limited resources (across all domains such as energy, fishing, environmental protection, nature preservation, leisure and shipping) of the marine space. The open sea space should be regarded as an important resource. A parallel was drawn with terrestrial based ideas for resource management.

What is the impact on the wider logistics in the NSR?

A good **analogy** was discussed in the workshop. – the idea of the existing NSR logistics being analogue and the future needing an **analogue to digital shift.** This recognised the need for a **paradigm shift in the approach to NSR logistics and services** in the next 20-30-40 years.

It will be **crucial that small ports are connected to the e-Navigation systems of the future** NSR in order to maintain their viability and be fully utilised. The e-Navigation services being targeted appear to be more addressing the needs of larger ports and SOLAS vessels, but the solutions and services need to be equally relevant to smaller ports and non-SOLAS vessels.

Where are there likely to be NSR traffic pinchpoints and problem areas in the next 20 years?

The Forum highlighted the expected areas of the Dover Strait, German Bight, entrances to river and canal systems, but now also **identified open sea areas such as Dogger Bank**. As the shipping density increases and traffic patterns evolve into more restricted sea space, the encounter rate of ships meeting each other increases, and there is a higher risk of collision and accidents.

The Forum discussed the need to enable **cross-border consultations**, which are often encapsulated in existing legislative requirements and directives. How do we facilitate these discussions for aspects of e-Navigation and how do they fit into the scheme of governance? The approach varies between member states. Without wishing to invade the realm of Marine Spatial Planning, the existing system of sea governance is established **and the maritime stakeholders of ACCSEAS need to engage** with this. So the question arises, '**How do we provide the knowledge and input about e-Navigation to these cross-border consultations?**' This needs to be done in a way that addresses all aspects of e-Navigation benefits and opportunities as expressed during IMO's NAV54 convention. How do we engage the different scales of consultation at local, national and regional levels?

There needs to be an ongoing discussion of all of the above issues and all stakeholders are welcome to contact the project to add to the debate and raise further issues.

3.7.1.2   Workshop 1 Discussion and Comments

The concept of **'Carrying Capacity'** was introduced for the NSR. This is the idea that a resource (such as the open seas of the region) has a limited capacity to support a number of activities. Can we define the carrier capacity for the North Sea? If we can, is it possible to use e-Navigation to increase the carrying capacity of the NSR's marine areas? By making maritime navigation safer and more efficient, does this enable the NSR marine resource to support more activities in a planned and sustainable way?

Shipping is global, but it **takes a long time for a regional project such as ACCSEAS to spread its results worldwide**. Singapore had its information system 10 years ago, and it works very well. They appreciate the system now, especially in its effect on fuel savings, but it is difficult to realise such a solution in the North Sea. Can the ACCSEAS legacy and sustainability plan consider the expansion of its findings across Europe and beyond?

The issue of risk assessment is important, but careful interpretation of risk analysis is needed. It is based on statistics of sparse events. Fortunately, the accident rate is sufficiently low in the NSR that **it is challenging to validate a risk assessment properly with confidence** and statistical significance. There needs to be risk assessments that everyone can agree, as the required models are not in place, so the project needs to recognise this and investigate further.

Mariners' Views

In order to utilise the limited NSR sea space available in the future, lessons can be learned from Singapore, in terms of **moving the navigation responsibility to the shore**, as well as reduced crew numbers on board, leaving the navigator more like the air pilot of today, only intervening when the shore systems fail. The 'quick wins' may be the **effective presentation of the information** and to find the models that present only the necessary information and exclude the other information from the display that is not relevant for the vessel's context.

ACCSEAS can support the right steps to increase efficiency and accessibility in the NSR. Navigation developments in the NSR need to be kept simple and carefully consider the workload on the mariner.

Further Views

There has been a plea for access to SafeSeaNet for information for the ports to allow them more efficient forward planning. There is a need to ask whether this is possible. Can this be addressed by ACCSEAS as part of the project's engagement and influence on European policy? The ports need to be fully involved in the e-Navigation information exchange and help to ensure the reliability of shore-based information to vessels.

A bold statement, 'Mare Liberum does not exist in the NSR when looking ahead to 2020'. ACCSEAS should consider the risk analysis of legal issues associated with e-Navigation services. Within this context, ACCSEAS should consider the use and re-use of e-Navigation information, its reliability issues regarding the exchange of information and its source and quality. These issues will not be resolved by e-Navigation, but the need for their resolution should be highlighted. Discussion of UNCLOS is necessary that would not happen in IMO. There is a need for awareness of e-Navigation to be raised and that the free use of the sea cannot be taken for granted in the future.

3.7.2   Workshop 2: Maritime Service Portfolios in the NSR

Facilitated by Jan-Hendrik Oltmann, as described in the conference programme: "This workshop focuses on what services should be provided in the North Sea Region (NSR) in the light of the future developments as part of a future NSR Maritime Service Portfolio

(MSP). Participants will be invited to give their views on required services, required service levels and required service coverage. Participants will also have the opportunity to share their ideas regarding innovative services for the NSR which would - once implemented - improve accessibility to NSR ports."

The Forum discussion points are collected below. The Forum raised many questions which are highlighted using a 'Q-x'? notation below.

3.7.2.1   Introduction (20 minutes)

- The *Canadian e-Navigation MSP example (IALA e-NAV7/10/2)* was distributed on paper and introduced. (5 minutes duration)

- *Should a future NSR MSPs plan, as adapted from the Canadian example to the NSR, be desirable?* (pros & cons) (10 minutes discussion)

Yes: There was a **general support for taking the Canadian example as a starting point in terms of the format of a future NSR MSPs plan**, while there may be different assessments in terms of content.

Q-1: The question was raised whether there are other **MSPs plans available globally**. This would require some research.

Q-2: The feasibility to create a NSR-MSPs plan, which would reflect the **user-desired/needed service provision**, would need to be demonstrated.

While the NSR should be construed as one region, this raises the questions

- Q-3: how it **interfaces to potential national MSPs plans**?
- Q-4: how and, if at all, a migration might be possible?

- *Would it be a desirable goal to create a first draft of such a future NSR MSPs plan within the remainder of the ACCSEAS project?* (5 minutes discussion)

Yes: There was general support that ACCSEAS, during the remainder of its project duration, should **strive to create a first draft of a future NSR MSPs plan**.

Q-5: It was advised that **individual services** considered within ACCSEAS' first version of the NSR-MSPs plan **should be prioritized**.

Q-6: It was requested, that the **dependencies between services** within the NSR-MSPs plan **should be determined** and described. As an example the real time tidal data provision service would be required for any Under Keel Clearance service; hence any UKC service would depend on an appropriate real time tidal data provision service.

Q-7: How are **existing services** (such as NAVTEX, ice charts) migrated into the ACCSEAS created NSR-MSPs plan?

Q-8: How are **new services** introduced into the ACCSEAS created NSR-MSPs plan?

Q-9: How is the **"best practice approach"** being incorporated when crafting the NSR-MSPs plan?

Q-10: How does the outcome of ACCSEAS affect the **work of VTS centres** in the future?

Q-11: How could **mariners/crews familiarize themselves**, or be trained to cope / to engage with the MSPs?

3.7.2.2 A future NSR Maritime Service Portfolios (NSR-MSPs) (30 minutes)

Let's assume the future NSR MSPs plan would be adapted from the Canadian example to the NSR, how would it need to be structured in general terms?

I.e. we turn to the *columns and their headings* first.

- *Which structuring principles should be applied for the columns?* (15 minutes discussion)
    o Geographical areas of the NSR (as with the Canadian example)?
    o Traffic-analysis based (present / future) using a Route Topology Model approach?
        ▪ Categories of routes: Motorways of the Sea / other layers of routes?
    o Combination of both?
    o Other approach?

It was suggested to **correlate <u>voyage phases</u>** (compare appropriate slide of Richard Hill's presentation on Day 2) **with the Route Topology Model and area coverage**.

It was further suggested, that the **structuring principle** for the columns should **<u>not be any rigid geographical areas</u>**, based on whatever definition, but **<u>rather voyage-and/or traffic situation related</u>** as follows:

Finally, it was suggested to **identify different <u>traffic pattern regions</u>**, thus being sensitive to the traffic, for the NSR-MSPs plan in order to arrive at the sets of services required for those traffic pattern regions.

There was suggested a precise priority scheme for the column structuring principle:

- **1st priority**: consider **traffic pattern + phases of voyage** the structuring principle;

- **2nd priority**: only if this leaves margin for the need to further structure, then the **coverage area** concept should be employed.

- **Rationale** was presented as follows: It is required to step back and re-consider the origin of the area definitions, namely that the area definition for service provision stems from a time when feasibility of technological service provision was designated rather than reflecting actual user needs. Since the technological progress may now allow the provision of services in a much more differentiated way, traffic-sensitive and voyage-phase related structuring principles may and therefore should be employed to define service provision.

Q-12: This raised the matter of **granularity / scalability** of such definitions.

The future North Sea **Route Topology Model** (NSR-RTM) should allow the **assignment of attributes to its "legs"** which take into account the above considerations, namely the traffic patterns and the voyage-phases as opposed to (coverage) area. Examples for such attributes were given as follows:

- "estuaries" (river approaches to ports)
- "along coast"
- "crossroads"
- "canal / inland waterway"
- "open sea" (as little as left in the future NSR)
- List not complete.

(The notion to create an area such as "The Channel/Dover Strait" was abandoned after this discussion because it is assumed that the above principles would render a traffic pattern / voyage phase structure class which would be fully appropriate for the situation in The Channel or the Dover Strait.)

It was concluded that the above principles applied to the elements of the NSR-RTM would lead to the required services and required service levels, i.e. the above methodology would render a seamless derivation and thereby a strong justification for the MSPs associated with those elements of the NSR-RTM.

Q-13: Consequentially, it was recognized that this **approach would need to be reconciled** in one way or another **with the present proposal of the IMO e-navigation Correspondence Group** to employ five area definitions only. There may be a need to investigate how the above findings may be introduced into IMO's e-navigation strategy.

Q-14: The question was raised what the legal backing for such a NSR-MSPs plan would be (i.e. within international waters), and how it could be reconciled with UNCLOS specifically?

- *How would the interfaces to MSPs in national waters of the NSR's countries be designed?* (10 minutes discussion)

It was concluded, that if a NSR-MSPs plan were to be set up employing the above methodology both for the NSR at large and for the MSPs in national waters, <u>there would be</u> **no visible interface**, i.e. there would be a **natural and seamless continuation**.

- If traffic-analysis based routes and the Motorways of the Sea concept would play an important part of that, ***should Motorways of the Sea in the NSR, in the future, be protected by a NSR-TSS-Network as adopted by IMO?*** (5 minutes discussion)

<u>Yes:</u> There was general support that the COLREG privileges of TSS should be aligned to Motorways of the Seas throughout in the NSR. Such a NSR-TSS-Network would provide **robust protection of shipping lanes and shipping interests** when balanced with the compelling interests of other uses of sea space.

<u>Caveat:</u> When applying for a TSS at IMO, the **"compelling need"** needs to be demonstrated to IMO, and the risk of unjustified restrictions to innocent passage elsewhere globally, as implied by reciprocal action due to such ship routeing measures, should be mitigated. Also, the density of traffic needs to be demonstrated, too, to justify a NSR-TSS-Network.

<u>Caveat:</u> Efforts should be taken that **such NSR-TSS-Network should <u>not</u> be construed as an opposition against Renewable Energy**. It was stressed that such a notion would not be the true intention of creating a NSR-TSS-Network aligned with the Motorways of the Sea concept.

<u>Caveat:</u> To achieve a NSR-TSS-Network, unanimity amongst administration bodies, across the NSR and within countries, would be required.

3.7.2.3   The services of a future NSR Maritime Service Portfolios (30 minutes)

In this part of the Workshop, the ***future NSR MSPs' spectrum*** was discussed*.* i.e. attention now turned to the ***lines and their headings*** of the Canadian example.

- **Category MSPs level:** The categories constitute in themselves MSPs, again (generic category MSPs). (15 minutes discussion)
    - ○ ***Are the Category MSPs of the line headings OK as they are, or are amendments needed?***
    - ○ ***If so, what would be the amended Category MSP?***

It was felt, that the **line headings** of the Canadian example were **not fully appropriate**, as the distinction of operational and technical service spectra does not appear to be observed.

"Mixing" operational vs. technical MSPs / service spectra should be avoided. The<u> categories of services</u> should be reviewed and made consistent.

The introduction of shipboard functionality (such as "Radar Positioning") in MSPs should also be **avoided**, which is considered as a shore-based service provision catalogue/plan.

It was suggested to introduce as an attribute a "general connectivity indication", such as "ship-shore", "shore-ship", "ship-ship" etc.

- **Individual services level:** (15 minutes discussion)
    o ***Are the identified services OK as they are, or are amendments needed?***
    o ***If so, what services would be***
        ▪ added?
        ▪ deleted?
        ▪ amended?
    o ***Are there particularly innovative services which are missing?***
    o ***Which services are particularly important thus to be highlighted?***

Q-15: **Information services from ports (to ports)** such as berth related services should be included, e. g. information services on port facilities (i.e. metadata services).

Q-16: Appropriate "handshaking"-methods, i.e. **acknowledgments on the application layer**, should be associated with appropriate MSPs/services.

Q-17: It was suggested that the **voyage related intentions** of (individual) ships should be received / known by shore (at runtime) in order to provide optimum MSPs / services for those vessels approaching.

Q-18: Operators of offshore installations should be considered as service providers in a future NSR-MSPs plan (for e.g. "keep-away" information services; e.g. at cable crossings).

Q-19: It was suggested to introduce a model, based on the well-established system engineering concept of 'finite state machines', of "**information states of vessel**" during all phases of a voyage, including voyage preparation of voyage. Such an "information state of a vessel" would show, as a summary token, whether the vessel has acquired the necessary information relevant for the next phase of the voyage.

3.7.2.4   The way forward with the future NSR MSPs (20 minutes)

This part turned towards collecting ideas as to the way forward in procedural terms.

- ***What would be the steps towards a future NSR MSPs during the duration of the ACCSEAS project?*** (10 minutes discussion)

- ***How could the work on a future NSR MSPs plan be further facilitated?*** (10 minutes discussion)

It was suggested, that **ACCSEAS would create descriptions** of the above concepts and notions as **"living documents"**, which would be promulgated to the NSR communities for regular or even "constant" review.

3.7.2.5   Workshop 2 Discussion and Comments

The 'intention of ships to be received by shore' was further explained as the ship informing the shore of its next phase of the voyage, for example its intention to transit a lock or dock, in order that the shore can provide optimal and appropriate MSP services. These could be 'push services' from the shore, rather than 'pull services' requested by the ship, requiring further investigation.

The MSP providers of services could include offshore service providers, such as energy companies providing a 'keep away' warning as an information service.

3.7.3   Workshop 3: How Do We Navigate the Future North Sea Region?

Workshop 3, facilitated by Thomas Porathe, approached the question of possible regional e-Navigation solutions that could be implemented by the ACCSEAS project for the North Sea Region (NSR), with a focus on user requirements and the experiences of users, especially mariners and shore-based operators.

3.7.3.1   Candidate Elements of the e-Navigation Test-Bed in the NSR

The workshop considered a list of suggested e-Navigation solutions that have been identified within Work Package 3. This list covered:

- A **Network of Shipping Lanes** in the North Sea, based on a **Route Topology Model** (RTM), comprising legs, nodes and junctions that describe the flow of shipping in the region. The constituent parts of the network could be assigned appropriate attributes of the available e-Navigation services within the Maritime Service Portfolio (MSP).

- **Augmented Reality Head-Up Display** (HUD) on the bridge to provide visual cues to the mariner such as alerts to impending collision or grounding. For example, a visual cue could be overlaid synthetically on the real-world view to indicate the direction of an imminent collision risk.

- **Multi Source Positioning**, ensuring the resilience of the vessel's Position, Navigation and Timing (PNT) information used throughout e-Navigation services and in particular implementing backup systems that mitigate the vulnerability of GPS to deliberate and natural interference.

- **'Route Exchange' services** in which a vessel's projected future route could be exchanged over appropriate communication links ship-to-ship, ship-to-shore or shore-to-ship. A vessel could transmit its 'intended route' to advise other vessels in its vicinity of its intentions. Similarly, shore-based services could transmit a 'route suggestions' to the ship to advise potential alternative routings and their benefits as a decision aid for the mariner.

- Coordination of Voyage Plans, using the **concept of 'voyage number'** to index attributes of vessels' voyages. Working in collaboration with the proposed Mona Lisa 2 project, tactical 'route exchange' services could be complemented by the approach

to strategic dynamic separation of vessels based on the de-confliction of voyage plans and the concept of 'safe havens'.

- **Harmonisation of Maritime Safety Information (MSI) and Notices to Mariners (NM)** to provide timely information to mariners by the appropriate means and with effective portrayal on the ECDIS or e-Navigation displays.

- **Under Keel Clearance Advice** for individual vessels, including the calculation and portrayal of **dynamic 'NoGo' areas**. These are areas in the vicinity of the ship which cannot be safely navigated according to tide and sea conditions, hydrography and vessel conditions (e.g. draught and squat). Such areas can be indicated on ECDIS or e-Navigation displays to provide a decision aid for the mariner.

The workshop considered whether any of the innovative services in the above list of candidate elements of a North Sea Region e-Navigation test-bed should not be taken any further or modified. No deletions or amendments were proposed and hence it is understood that the Forum generally endorses the technical scope that is being proposed for the test-bed e-Navigation services.

3.7.3.2   Key Points from Workshop 3

Key points from the discussion of the Forum are captured below:

- The e-Navigation test-bed solutions could carry a risk that more and more additional information is provided to the mariner (and shore-based operator) which could result in an **information overload**. Clearly, the harmonisation and integration concepts of data and information for e-Navigation, together with due consideration of human factors, should ensure that information is prioritised, categorised and streamlined in such a way that the 'Data to Information' process is optimised and the cognitive loading on the mariner is reduced. Nevertheless, the Forum recognised the inherent risk of information and cognitive overload and the need for appropriate design of the solutions taking full account of the human-in-the-loop engagement.

- The test-bed should maximise the potential advantage of e-Navigation to **off-load the information burden from the mariner**. An important aim should be not to create new data, but to integrate the existing information for the mariner to digest in an easily understandable way.

- The provision of the test-bed services could lead to **professional de-skilling of the mariner** and such e-Navigation solutions could be accused of causing such a decline in skills. If mariners do what they were trained to do, would e-Navigation be needed? Furthermore, professional skills may be at risk if test-bed services require less knowledge and skills of the mariner. It was noted that the expected career duration of an officer on the bridge is only nine years, so mariners' experience tends to be limited and significantly less than say 20 years ago. Hence the decision aids of e-Navigation services could be supportive for today's less experienced mariners.

- New e-Navigation services may **increase the training burden** for mariners, requiring familiarity with new systems on the bridge. This may be eased by the consideration of standard system settings and presentation formats (the S-Mode that has been proposed elsewhere for selection of a standard configuration). The ACCSEAS project includes a training needs analysis for each of the candidate solutions implemented and demonstrated.

- Increased portrayal of e-Navigation information on head-down displays, such as ECDIS, could **reduce the time that mariners spend on look-out through the window**. Human factors of portrayal and systems that encourage look-out need to be considered. The idea of presenting some information on head-up displays may be one approach to that helps maintain situation awareness visually.

- The multiplicity of confusing bridge alarms is an issue requiring investigation of **alarm management** on the bridge and the balance between visual and audible alerts. It can be impossible for the mariner to find which bridge system is causing the alarm. The harmonisation of e-Navigation data should seek to simplify the alarms and the mariner's response rather than add to the confusion.

- An issue was identified of **small vessels exiting wind farms and impinging on major shipping**, especially as ships may be increasingly confined to 'street-like' conditions of narrow traffic lanes. It was suggested that this situation may require new rules (developed within the collision regulations) that deal with major shipping lane traffic having to give way to small vessels that emerge unexpectedly. It was suggested that it would be helpful if stakeholders knowledgeable in COLREGS, ships' manoeuvrability, planning and construction of wind farms could convene to consider the North Sea interactions with shipping in the context of the future route network.

- In the future network of shipping lanes, will **new Aids to Navigation** (AtoNs), AIS transponders or virtual AtoNs, be needed to guide shipping at the entrance to confined channels or narrow lanes?

4   Day 3

4.1   Conference Conclusion with discussion, Prof. Jens Froese

Prof. Froese welcomed the audience to the final day of the conference, and invited the audience to participate in the morning's discussions.

Some EU projects look to produce directives and one gave birth to e-Maritime. At the time it wasn't clear what e-Maritime was or what it could be. On a completely different platform at the same time, e-Navigation was created by the IMO. Some feel that e-Maritime has nothing to do with e-Navigation, but there is at least one point that links both: the estimated time of arrival.

In e-Maritime there are two process chains. One is the ship systems, including the ship processes. The other is to do with cargo and passengers. Both chains are driven by the ETA, which is created in an area covered by e-Navigation, so there is a link between both topics. The project advised the EU to investigate e-Navigation to see how e-Maritime could be linked to e-Navigation and how the two can work together- the EU have listened and DG MOVE have participated in several e-Navigation meetings. As such, e-Navigation is now on the agenda of DG MOVE and was in mind when the next call of the research activities, with the intention to include an e-Navigation project within the first call of the next round of funding.

The EU is looking for example projects and each member state has received an internal memo asking for information and advice. Usually these memos remain within the administrations, but Prof. Froese would like to seek the advice of the audience present, what do we want to see? Prof. Froese would like to discuss this and use this information within his submission.

He presented an IMO report (STW 44/6) on the development of an e-Navigation strategy implementation plan, with particular focus on the correspondence group criteria for e-Navigation. These include:

- Seamless transfer of data between various equipment on board

- Seamless transfer of electronic information between ship and shore and visa versa

- Work should be based on systems that are already in place

- The IMO e-Navigation Correspondence Group (CG) should not concentrate on determining case of marine casualties

- List of potential e-Nav solutions should be limited to achieve points one and two above.

The CG prioritised five solutions:

- improve harmonised bridge design

- Means of standardised and automated reporting

- Improving reliability resilience and integrity of bridge equipment

- Integration and presentation of available information in graphical displays

- Improved communication of VTS service portfolio

Prof. Froese explained that we are not restricted to these points, as research allows us to move around these, but he asked the audience what ideas do we have for further work in this area?

An audience member commented that the correspondence group had the task to concentrate on feasible topics where they could expect to get some results. Norway leads the work and proposed the five headings, but they are still under discussion, the paper presented is an information document and therefore not finalised.

The paper also called for a risk assessment and also a gap analysis, which leads to further work. At the moment this document is going directly from the risk assessment to the solutions, without exploring the gaps or how they could be implemented. It is noted that the five criteria are interlinked, but they will be the focus area moving forward.

The paper also talks about the human factors as well as legal, economic requirements etc.

Prof. Froese asked whether the gap analysis could be used within the EU, but this was not clear.

Some of the audience found the document frustrating, given that the five points (listed above) contain two positive points and three negative points. The latter were instructions from the IMO secretariat as it was realised that e-Navigation was a huge task without a defined end. It was commented that these five lines were forced into this report and it should be kept in mind that this is a report to one of three IMO sub committees and the report to COMSAR was a lot more positive and more realistic. The IMO NAV committee will need to decide the way forward and there are many discussions on going, looking to modify these five points.

It was noted that NAV58 saw several documents from Germany which discussed the development of the INS, which were noted but were not actioned. The first two of these five points really look to develop these. The IMO don't really know much about the shore side, and there is an interaction between IMO and IALA, with IALA taking focus on the shore side of e-Navigation. e-Navigation is all about interaction and therefore there should be a connection to the logistics chain, although the IMO appears to have dropped that link.

A statement from the EU Rep at NAV57 was recalled, that "there will be no e-Maritime without e-Navigation - as the capabilities of e-Navigation in the future make e-Maritime happen". It was also noted that, at an EU meeting last year, the conference leader opened the programme by asking the audience what e-Maritime meant, as he didn't know.

There is an opportunity for e-Maritime to focus on a number of issues, without looking to re-develop e-Navigation, raised during this conference's workshops. Items that could be addressed include how equipment should be harmonised and how the national single windows could be developed within e-Maritime, complementary with e-Navigation. Worldwide a common data model is being developed using the S-100 registry format with the support of IMO, IALA and IHO. One worldwide register is being developed and there is a benefit in e-Maritime harmonising with this.

4.2   The Way Forward: North Sea Regional e-Navigation and Accessibility, Mr. George Shaw

Mr. Shaw presented on the future of ACCSEAS and the conclusion of the conference.

ACCSEAS exists within the international and European framework and all of the points just discussed are important to the programme and there's a lot of correlation with how ACCSEAS will move forward with its work.

Mr. Shaw started by explaining where we are, with the different traffic flows across the region with the key pinchpoints highlighted where the problems here can reflect those experienced across the world, making the NSR a great test-bed area. The growth of ships and reduction of space lead to more accidents and George showed where accidents occur and how the project has looked at the NSR with the IWRAP model, the project is developing the route model to prevent groundings and collision. An early topology model was shown where the colours represent the risks expected.

The location of a test-bed within the region is a tricky choice, and we decided to look at solutions that were scalable and looked towards the southern North Sea.

Looking ahead to 2020+, we have to think about traffic flows and we are aware of other programmes that are looking at traffic flows and we are keen to work with them. The recent economic downturn has made it a lot harder to estimate traffic flow and age of ships etc.

The growth of wind farms and other offshore industries have been gathered from official sources and included in the GIS to develop the ACCSEAS system - giving a very powerful tool for ACCSEAS but also for North Sea planning going forward - providing the first legacy of the project. The many different layers allow the GIS to show many different aspects.

The project is very keen to make this information available and will make the GIS available on the website.

Short sea shipping is another focus and if we consider the example of the ferry from Zeebrugge taking an awkward route to avoid a wind farm, e-Navigation tools can contribute to safer and more efficient logistics. With such solutions, we can look forward to a sustainable future for this region.

The change towards e-Navigation can be likened to the change from analogue to digital, and one of the key points from the conference was to put the mariner at the heart of the future and to enable them to navigate with confidence in the information provided.

The test-bed will focus on the southern area of the North Sea with scalability across the whole region. It is a practical programme of implementation and we need to produce a practical system that can then live on and be used by subsequent programmes. However, some of the solutions can't be demonstrated in the real world and we will then demonstrate them through simulation.   The next step moving forward will be to focus on the architecture

of the test-bed, based on the work of the IMO etc. From there, the project will determine the candidate services that can then be used within the test-bed.

The project will look to develop the RTM and there is a basic model available based on today's traffic analysis, but we need to do this for the future North Sea following the new routing and traffic densities expected. This will then allow us to compare the two IWRAP results. Once we have the architecture, we then have the basis of the implementation components and we can then start the work to evaluate the test-beds and the simulations. We will make use of the IMO S-100 common data structure and we need to investigate how this interrelates with other European alternatives. We will need to make sure we examine the human factors considering items like loading, overload, training and the mariners' skills.

The test-bed will involve technical and operational services. On the technical side, the resilient PNT stream will look at a number of candidate options, including R-mode, radar absolute positioning and eLoran. These positions would then be integrated into a prototype integrated navigation system with the focus on the integrity of this information, along with the required accuracy, availability and continuity aspects.

This then brings us into the operational services, with the MSPS. The other services include the intended route, augmented reality HUDs, mariners notification etc.

There will be many opportunities for stakeholders to interact with the project with various workshops and an advance notice of the conference meeting next year in Edinburgh was given.

4.2.1   Post-presentation Discussion

Prof. Froese asked a non-European, Dr. Park, what he made of the conference. Dr. Park is from Korea, and thanked the ACCSEAS team for the conference. Before the conference he had some scattered and fragmented ideas of e-Navigation, but through the conference he had learned more and can see a greater understanding and links between the parts. Smart phones have changed our way of life and he believes that e-Navigation may change the way we navigate. He advocated looking for a solution within the problem - for examples can we use the wind farms to provide information, internet connectivity etc, to benefit the mariner?

Prof. Froese further explained that he is not involved in ACCSEAS and therefore independent, but feels this is one of the best conferences he has participated in and wouldn't have wanted to have missed any of the sessions. He noted all the work that went on behind the curtains, and explained that there was a lot of work completed behind the scenes and they have done a great job. He then thanked the audience for their involvement.

4.3   Closing Remarks, Mr. Roger Lockwood

Mr. Lockwood closed the conference with three points:

- The conference is the first opportunity for ACCSEAS to demonstrate to a wide audience what's been achieved so far and what we can do in the future.

- The second point is the future. The project has just less than two years left and there's a lot to achieve to ensure the project does deliver a legacy. Hopefully, ACCSEAS can do a lot of this over the next two years and will involve us all working together, not just the partners but also the wider public and he asked the audience feed into the project, whether by the website or as part of the working groups.

- Mr. Lockwood thanked everyone, but won't repeat the thanks that Dr. Williams gave the previous evening and mention names, but rather organisations:
  - Scherer and Friends who have completed the organisation behind the scenes;

- o   Flensburg University of Applied Sciences - for the venue, the lunch and especially the warm welcome given to us;

- o   WSV gave a huge contribution with the University to ensure the conference moved forward;

- o   All of the speakers for their contributions leading to the useful discussions;

- o   All of the guests - thank you for coming and we are grateful for your input;

- o   To the partners - for their work in making sure the project succeeds;

- o   Prof. Froese and his assistant for chairing the conference and for helping to make the conference a success.

One final thank you is given to INTERREG IVB who funded the Conference, which demonstrated one of the most important parts of the conference: people working together and talking together.

Roger closed the conference and invited the audience to note the 2nd ACCSEAS conference next year in Edinburgh.