

SPECIAL ISSUE ON THE MARITIME SECTOR DEVELOPMENTS IN GLOBAL CONTEXT

ISSUE NO. 6, 13 NOVEMBER 2013

EXPERT ARTICLES:

- Jochen Schulte and Roger Jansson:** *The maritime agenda of the Rapporteurs of the Baltic Sea Parliamentary Conference on Integrated Maritime Policy* Page 1
- Janne Tamminen:** *The future of maritime regions around the Baltic Sea* Page 3
- Gun Rudeberg and Chris Wooldridge:** *Clean Baltic Sea – the role of ports* Page 4
- Emil Arolski:** *LNG in Baltic Sea Ports Project* Page 5
- Stefan Jankowski:** *Possibilities for the use of LNG as a fuel on the Baltic Sea* Page 6
- Gonçalo Carneiro:** *Maritime spatial planning – a new layer in integrated marine management* Page 8
- Michael Baldauf:** *e-Navigation – a key for safe, efficient and sustainable shipping* Page 9
- Proshanto K. Mukherjee:** *The international legal framework of MONALISA* Page 10
- Mikko Varjanne:** *Using modern web-based solutions in connecting marine industry professionals* Page 11
- Raphaël Baumler:** *Containership gigantism – reaching the limits of uncertainty* Page 12
- Neil Bellefontaine and Ilias Visvikis:** *The current and future needs of postgraduate maritime education* Page 13
- Urszula Kowalczyk:** *Current trends in the Polish maritime industry* Page 14
- Alari Purju and Eva Branten:** *Maritime sector stakeholders and new regulations* Page 15
- Sari Nyroos:** *SmartComp – Finnish perspective through national consultation days* Page 16
- Esta Kaal and Kaja Tampere:** *Does the Central Baltic region maritime cluster need a brand?* Page 17
- Tony Munoz:** *Surging U.S. energy production revives maritime sector* Page 19
- Arto Kuuluvainen:** *Finnish marine SMEs in Brazil* Page 21
- Makiko Kubo and Takuma Matsuda:** *Seafarer demand forecast based on economic conditions* Page 22
- Ari Virtanen:** *Korean marine industry and opportunities for Baltic region* Page 23
- Jari Makkonen and Sari Arho Havrén:** *Common value chains in East Asia – case shipbuilding* Page 24
- Minghui Gao:** *Skyrocketing Chinese maritime cluster and its future development with international partners* Page 26
- Eini Laaksonen and Hanna Mäkinen:** *The booming maritime sector in the Far East – what's in it for Finnish companies?* Page 27

To receive a free copy, print or register at www.utu.fi/pei

The maritime agenda of the Rapporteurs of the Baltic Sea Parliamentary Conference on Integrated Maritime Policy

By Jochen Schulte and Roger Jansson

As the region's common element the Baltic Sea offers countless opportunities for cross-border cooperation. This is true for sustainable development, public health and social wellbeing and also for economic growth. The Baltic Sea brings together a labor force of 67 million people, representing 30.9 % of the total EU labor force. The Baltic Sea Region makes up over 25 % of Europe's economic strength and is responsible for one third of all European exports. Europe's maritime economy is innovative but is also confronted with a number of challenges: the effects of the global economic crisis of 2008, the accompanying decline of large parts of the seaborne trade, competition from new players, and a growing oversupply of tonnage.

As Maritime Rapporteurs of the Baltic Sea Parliamentary Conference (BSPC) we follow and report on developments in the field of Integrated Maritime Policy.

The Baltic Sea Parliamentary Conference is currently made up of 11 national parliaments, 11 regional parliaments and 5 parliamentary organizations around the Baltic Sea. The conference aims at fostering the common identity in the Baltic Sea Region and at facilitating the exchange of the involved parliaments with the other organizations at the international and interregional level. The Baltic Sea parliamentarians deal with common ecological, social, and economic issues, initiate corresponding political measures and accompany these. We held our latest annual conference in Pärnu, Estonia on August 25 - 27, 2013.

For us, the CBSS is a natural correspondent on governmental level. We as parliamentarians are also a transmission belt between public, executive authorities and specialists. Also for this reason one issue that we as Maritime Rapporteurs constantly deal with is the problem of how to optimize the framework for the maritime industry in the region to help its competitiveness. First and foremost there are changes to the Directive 1999/32/EC of 26 April 1999 relating to a reduction in the sulfur content of certain liquid fuels and amending Directive 93/12/EEC. The Council passed the directive in a vote on October 29, 2012. Parliament and Council agreed to adapt existing EU legislation to revised, stronger IMO regulations concerning the reduction of sulfur limits in marine fuels as from 2015 in Sulfur Emission Control Areas (COM(2011) 439 final). We have addressed the issue in a number of conferences and events, among others during a conference on the competitiveness of the maritime economy in the Baltic Sea Region, organized by the Maritime Rapporteurs on April 12, 2013 in Schwerin.

The stronger sulfur limits were background for a letter from the rapporteurs to the European Commission, HELCOM and the Council of the Baltic Sea States (CBSS), in which we made aware of the difficulties arising from different national state aid policies for the shipping industry. Only through similar implementation of state aid rules and incentives can we achieve a level playing field for the maritime industry.

The conference in Schwerin provided important input for the XI. Southern Baltic Sea Parliamentary Conference on June 2 - 4, 2013 in Schwerin. The delegations of 7 Southern Baltic Sea regions passed a resolution, which among others called for economic incentives for fleet rejuvenation, the facilitation of alternative ship engines and fuels, and a common approach to a liquid gas bunker infrastructure.

These demands also found their way into the final resolution of the 22nd Baltic Sea Parliamentary Conference in Pärnu.

In our work as Maritime Rapporteurs we have also called attention to a number of other important legislative developments at the EU level, which are going to affect our own industries and those of countries that will operate in the Baltic Sea.

Very topical for our work is a Commission proposal for a regulation on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport and amending Regulation (EU) No 525/2013 (COM(2013) 480 final). In June 2013 the Commission had set out a strategy for progressively integrating maritime emissions into the EU's policy for reducing its domestic greenhouse gas emissions (COM(2013) 479). The strategy consists of three consecutive steps: monitoring, reporting and verification of CO₂ emissions from large ships using EU ports; greenhouse gas reduction targets for the maritime transport sector; further measures, including market-based measures, in the medium to long term. The proposal for a regulation would implement the first step in the strategy. It would create an EU-wide legal framework for collecting and publishing verified annual data on CO₂ emissions from all large ships (over 5,000 gross tons) that use EU ports, irrespective of where the ships are registered. Ship owners would have to report (at the latest as of August 31, 2017) and monitor (as of January 2018) the verified amount of CO₂ emitted by their large ships on voyages to, from and between EU ports. Owners would also be required to provide certain other information, such as data to determine the ships' energy efficiency. As of 2019 ship owners would be obliged to submit an annual report to the Commission and the respective national authorities regarding the emissions on board and any other climate-relevant information. As of June 30, 2012 all ships will have to carry a valid document on board, which confirms the correct reporting in line with the regulation.

In our talks with industry representatives it became apparent that the shipping sector has to contribute its fair share to global climate protection goals. However, the proposal so far seems to entail a disproportionately comprehensive obligation to monitor and report the aforementioned data. Furthermore, the monitoring would have to be verified by dedicated assessors, which further increases efforts and costs. The already tough competition between ship operators and builders and the rising fuel costs already induce a need on the industry to implement energy efficient shipping technologies. Furthermore, the Shipping Energy Efficiency Management Plan (SEEMP), a set of best practice measures for fuel efficient shipping, has been mandatory since this year. A contribution from the shipping industry to climate protection is only warranted, however within the parameters of what is economically feasible.

Another issue for the rapporteurs will be the forthcoming IMO decisions regarding the potential designation of the Baltic Sea region as a NECA area (Nitrogen Emission Control Area) from year 2021 onwards, whereby nitrogen will be restricted in the Baltic Sea. This is a scenario that the shipping industry must take into account.

A further issue on our agenda is the question of how to finance the technical improvements that come with the new environmental regulations. A lot of ship operators face the

problem of receiving increasingly less credits for new, energy efficient builds or energy efficient retrofitting of existing vessels. We therefore support the initiative by HELCOM to create a "Green Technology and Alternative Fuels Platform for Shipping", which would focus on the dialogue between the public sector and the private stakeholders, including ship owners, shipbuilding and marine design enterprises, manufacturers and ports, and the research community. High on the agenda will be the question of financial support schemes for the industry.

Among all the executive and non-governmental organizations in the Baltic Sea Region the Baltic Sea parliamentarians try to ensure that the voice of the legislative bodies is heard. We are your partner to work towards a healthy and prosperous Baltic Sea Region.

Jochen Schulte

*Member of Parliament
Mecklenburg-Vorpommern*

*Rapporteur of the Baltic Sea
Parliamentary Conference BSPC
on Integrated Maritime Policy*

*Former Chairman of the BSPC
Working Group on Integrated
Maritime Policy*



Roger Jansson

*Vice President of the
Åland Parliament*

*Rapporteur of the Baltic Sea
Parliamentary Conference BSPC
on Integrated Maritime Policy*

*Former Vice Chairman of the BSPC
Working Group on Integrated
Maritime Policy*



The future of maritime regions around the Baltic Sea

By Janne Tamminen

Conference of Peripheral Maritime Regions (CPMR) is an organisation of 160 regions around Europe. The Baltic Sea Commission (BSC) is one of its six Geographical Commissions representing 26 Regions around the Baltic Sea. Maritime issues are one of the main policy areas on the agenda of the CPMR Baltic Sea Commission. For most of the Member Regions, the sea is a crucial factor economically, environmentally, culturally and historically.

For the CPMR Member Regions the sea has several important meanings. The sector of maritime issues is very broad, covering a whole range of different kinds of activities. Accessibility and transport are crucial issues especially for the Regions whose economy is strongly based on exporting industries. Gas pipes and oil transport, offshore wind energy production, cables etc. emphasise the role of the seas as a corridor between producers and consumers. The activities on the Baltic Sea are increasing all the time and the Regions are looking to the future, to see how to increasingly benefit from this use of the sea.

Then, of course, another big issue is how to protect the sea, if the risks are increasing at the same time. Tourism and other leisure activities, as well as fisheries, are dependent on the well-being of the Baltic Sea nature. That is the reason why the CPMR Baltic Sea Commission strongly supports all the new methods to mediate different interests and avoid potential conflicts.

Maritime industries are very closely linked to other maritime issues. There will be great opportunities in the future to create new and sustainable growth in maritime clusters. Better and more advanced technology is needed. That will surely also help to improve safety at sea and in coastal areas. Around the Baltic Sea there is a huge amount of expertise in this sector of industry. Long experience of winter navigation is a good example of the special skills that will have a high demand in the future, not only in the Baltic Sea but also in the Arctic Ocean. In this field the BSC, as well as the CPMR as a whole, will support the Blue Growth Initiative.

But we need to address how to handle this situation which may be a little chaotic and how to minimize the risks. With the European Union's macro-regional strategies there is the possibility to create tools to manage the ever-increasing maritime activities. The CPMR Baltic Sea Commission considers the EU Strategy for the Baltic Sea Region to be an important tool in promoting the most significant issues with regard to the Maritime Policy sector.

Maritime Spatial Planning and Integrated Coastal Zone Management have been high on the agenda of CPMR Baltic Sea Commission during the last few years. In line with the work carried out by the CPMR in that field, the CPMR Baltic Sea Commission will continue its debates concerning the next steps in the action of the European Union. This will be realised in particular in relation to the draft Directive

published in 2013 by the European Commission, and with the work developed within HELCOM in relation to this issue.

Maritime safety is a big challenge while maritime activities are increasing. A serious accident or even a rather small oil leak could easily cause huge damage to all Regions around the Baltic Sea. The Member Regions of BSC will support all initiatives to improve maritime safety. Links with the initiative Baltic Science Park have been forged by the Regions and other organisations which were involved in the Baltic Master II project. BSC Member Regions are involved in CPMR activities relating to maritime safety.

In the CPMR's Maritime Agenda, the main policy guidelines include: A better Integrated Maritime Policy; to develop a European Maritime Policy with a strong territorial and spatial dimension; better knowledge of the oceans and a "Blue Growth" strategy that combines existing and emerging sectors and Oceans and Coasts protected from accidents and pollution. The Baltic Sea Commission provides its own input to strengthen and involve these political issues and supports the synergies with all initiatives implemented by the CPMR in the maritime field. Just like all CPMR Geographical Commissions, the BSC will also take part in the work carried out on these policy sectors at CPMR level.

In parallel to these developments, the BSC will continue to structure its work on maritime issues, through a synthesis of its work, in order to contribute to the strengthening of a maritime vision for the BSC Regions. The idea to potentially develop a European project involving BSC Regions has been discussed in the framework of the BSC Maritime Working Group, and will be taken further.

There are a lot of different kinds of organisations and actors around the Baltic Sea. Many of them have their own membership structure, agenda and way to work. However these organisations want to achieve significant cooperation, not to raise competition! For example the BSC cooperates very closely with BSSSC in particular, the Baltic Sea States Sub-Regional Cooperation, which is a political network of all the regions around the Baltic Sea and Norway. In the field of maritime issues, the BSC and BSSSC have a common working group.

The EUSBSR, as already mentioned, is of course an important part of the work of the CPMR Baltic Sea Commission and also a practical framework for cooperation. Regions that cooperate productively will create an even better future for the Baltic Sea.

Janne Tamminen

Executive Secretary

CPMR Baltic Sea Commission

Clean Baltic Sea – the role of ports

By Gun Rudeberg and Chris Wooldridge

Eutrophication may be regarded as one of the most severe threats to the Baltic Sea as it affects the structure and functioning of the marine ecosystem resulting in algal blooms and in turn, reduced water transparency and oxygen depletion. Shipping contributes to the eutrophication through nitrogen air emissions, sewage and waste pollution. There is consensus that the maritime transport system needs to be optimised to meet the demands of a sustainable development. The challenge is recognized not only by regulators and environmentalists but also by the port sector and shipping industry themselves.

A series of credible options for future management were recently developed in the CLEANSHIP Project (www.clean-baltic-sea-shipping.eu) that was funded by the Baltic Sea Region Programme 2007-2013, where it was part of the Action Plan of the EU Strategy for the Baltic Sea Region's Priority Area 4 "To become a model region for clean shipping". At policy level, CLEANSHIP was considered a component of the EU Baltic Sea Strategy flagship project to "Promote measures to reduce emissions from ships and enhance the development". At the strategic level the project was designed to bring about harmonisation of environmentally related harbour dues, to contribute to the IAPH Environmental Ship Index, identify existing agreements between ports, and to develop systems for the supply of shore side electricity, gas and LNG, and the provision of sewage reception in ports.

It is widely acknowledged that both current and future environmental management must serve not only the conservation imperative per se but must also assist in delivering sustainable development. The various stakeholders agree that sectoral and industrial objectives cannot be achieved in isolation but that an integrated and collaborative approach is essential at all stages from policy development to effective implementation through practicable activity programmes. As ever, ports may be considered to be in a unique position both as critically important logistic nodes and as organizations well-placed to facilitate and assist best practice.

In terms of quality of the environment including ecosystems and sustainable development in general, ports have an ever-widening role in terms of the functional organization necessary to deliver environmental protection and improvement at the quayside, throughout the port area, in port-city links and as part of the Logistic Chain. Port authorities may have fixed liabilities or as Landlords may be considered to be in a position to bring influence to bear on a wide range of operators and tenants. Their Environmental Management Systems (EMS) must cater for the range of stakeholders and the demands for evidence of performance (see, for example, prism.espo.be)

It is in the latter context that CLEANSHIP developed an approach so that Baltic ports could both assist shipping with the strategic objectives and actually demonstrate the Baltic Sea port sector's credentials by reference to an Index of benchmark performance.

1. EMS (input all 10)	2. Environment (Input any 5)	3. Shipping Aspects (Input 2)
<ul style="list-style-type: none"> • EMS • Policy • Sector docs. • Legislation • Aspects • Objectives • Training • Monitoring • Responsibilities • Report 	<ul style="list-style-type: none"> • Air & water • Water quality • Soil & Sediment • Habitats • Ecosystems • Noise & Waste • Ship emissions • Ship waste • Carbon & Energy • Water 	<ul style="list-style-type: none"> • Green Ship • Differentiated Fees • Reception facilities • Bunkering options • Speed reduction • Virtual arrival • Port infrastructure • Automated mooring • VTS

Summary of the major components of the CLEANSHIP Port Index. It is an adaptable model from which an Index may be calculated based on responses to selected indicators: 1. EMS- indicates the Port Authority's own credentials; 2. Environment - is a list of indicators for monitoring, and 3. Shipping - lists areas where ports can assist with objectives through collaboration.

Many Baltic ports can already demonstrate a pro-active and high standard of EMS (see presentations and reports at www.clean-baltic-sea-shipping.eu and www.ecoport.com). Future challenges for the Baltic ports are likely to focus on the need to continue to demonstrate their benchmark performance in terms of environmental protection and sustainable development in a transparent and publically available programme to an ever-widening group of stakeholders ranging from international regulators to local communities. The sector's own policy-making organization, the European Sea Ports Organization (ESPO) continues to recommend the production of an Environmental Report, networking to exchange knowledge and experience, endorsement of its Green Guide (www.espo.be) and adoption of its EcoPorts tools (www.ecoport.com). All these measures are designed to assist its members to achieve compliance through voluntary, self-regulation, reduce costs and risks, and to deliver continuous improvement of environmental quality.

Independent detailed analysis of the benchmark performance of the Environmental Management of Baltic Sea port partners in the CLEANSHIP project provided exemplar best practice in many key areas and high benchmark performance in terms of implemented EMS. Although each port is unique in terms of its geography and commercial profile, experience to date confirms that a networked and integrated approach throughout the sector and in collaboration with its other, major stakeholders will be essential to effectively manage the impact of the wide range of aspects given the open system and trans-boundary dynamics of the Baltic Region. The scope for further development, implementation and application of the Port Index could be a useful tool in demonstrating the credentials of Baltic ports, tracking trends of environmental performance, and measuring the extent to which sustainable development is being achieved. Members of the Baltic Ports Organization (www.bpoports.com) and ESPO are well-placed to continue the research-led collaboration that has contributed substantively to the tool kit of options available to assist the maritime industry in the Baltic.

The authors acknowledge with grateful thanks the input from the colleagues in Pilot Project 5 of CLEANSHIP from the ports of Tallinn, Rostock, Turku, Trelleborg, Kalundborg, Oslo, Helsinki, and Stockholm. The cooperation of the Baltic Ports Organization was much appreciated and special thanks to the Project administrators and organizers in the Port of Trelleborg.

Gun Rudeberg

Legal Counsel and Head of Environmental Affairs at Ports of Stockholm

Chairman of the European Sea Port Organization's Sustainable Development Committee



Chris Wooldridge

Dr., Honorary Senior Research Fellow Cardiff University, UK

Science Coordinator & Senior Trainer Eco-SLC.



LNG in Baltic Sea Ports Project

By Emil Arolski

About the Project

According to the EU's environmental and transport policies as well as the Baltic Sea EU Strategy (COM (2009) 248), the most negative effect of shipping is air emission. Thus, most of the ship owners operating in EU waters and sea ports would have to implement new internal strategies in order to meet the limits and emission criteria imposed by the European Union and other international organisations (e.g. IMO).

Moreover, a harmonised approach to the development process as well as utilisation of best practices is necessary on a European scale. One of the statements take into account the currently discussed Clean Power for Transport Package and the proposal for a Directive (...) on the deployment of alternative fuels infrastructure (COM(2013)18/2) which defines that **"publicly accessible LNG refuelling points are provided in all maritime ports of the TEN-T Core Network by 31 December, 2020, at the latest"**.

Baltic Ports Organization has initiated 'LNG in Baltic Sea Ports' project as a response to the IMO's decision to establish new sulphur content limits in marine fuels sailing in Emission Control Areas (covering the Baltic, the North Sea and the English Channel) from the 1st of January, 2015. Liquefied natural gas is perceived as one of key solutions to meet the new requirements.

The main aim of 'LNG in Baltic Sea Ports', co-financed by the EU TEN-T Multi-Annual Programme, is to foster a harmonised approach towards LNG bunker filling infrastructure in the Baltic Sea area. Seven ports are involved in the project – Aarhus, Copenhagen-Malmö, Helsingborg, Helsinki, Stockholm, Tallinn and Turku. Each of the project partners is planning the development of port infrastructure to offer LNG bunker stations to ship-owners in the future. Port of Helsingborg has been appointed as a Project Coordinator by the Steering Committee and the Project Partners.

The works in the ports focus on pre-investment studies such as environmental impact assessments, feasibility analyses for LNG terminals or bunkering vessels, project designs, regional market studies, safety manuals, etc.

The results of the studies will allow starting the physical investments in infrastructure for LNG tanking. Moreover, project works include a so-called 'stakeholder platform' which will facilitate a discussion among various actors, such as port authorities, ship-owners, gas infrastructure providers, energy traders and bunkering companies. The platform will also welcome representatives from the North Sea who will share their knowledge and views on LNG.

The project's idea is meant to deliver both credible know-how on LNG as a marine fuel and an answer to the IMO's sulphur directive. This will also contribute to the realization of TEN-T Priority Area 21 (Motorways of the Sea) in compliance with the EU Strategy for the Baltic Sea Region – a model area for clean shipping.

Project Activities

The detailed objectives of Activities from 1 to 7 are:

- Initiate and finalise pre-investment studies in 9 ports in the Baltic Sea Region which will provide the necessary grounds for investment of LNG bunkering infrastructure;
- Speed up and secure fast development of LNG infrastructure;
- Achieve a coordinated and harmonised approach in the pre-investment phase leading directly to investments LNG bunkering facilities in the Baltic Sea Region;

- Contribute to a decrease in emission to atmosphere and make sea transport more environmentally friendly;
- Provide possibilities for knowledge exchange between ports working in the same direction
- Provide guidelines for LNG bunkering infrastructure in ports that can be applied by other ports in the Baltic Sea region and in other regions in Europe;
- Facilitate use of LNG as fuel by the shipping industry by developing a harmonised approach for LNG port infrastructure;
- Present "state-of-the-art" concerning continuous investments in LNG bunkering for shipping in the Baltic Sea Region and in Europe.

Activity 8 - "Harmonisation and stakeholder platform" has been included within the framework of the project. The aim of the harmonisation process is to secure a common approach between the pre-investment studies in the different ports. Harmonisation activity will be disseminated and the completion of the sub-activity will result in the publication of a LNG Handbook that will represent the Baltic Sea Region as a benchmark for implementation of LNG in other parts of the EU.

The main goal of the second sub-activity "stakeholder platform" is to secure a dialogue process and disseminate the information gathered between the various stakeholders and the participating actors within the action and beyond. The stakeholders' platform will gather the key actors from the Baltic Sea Region and other regions within the EU and North Sea region.

At present, development of "LNG in Baltic Sea Ports" project is progressing satisfactorily and according to plan. Full involvement of the seven participating ports is obvious and visible.



The project will end on December 31st, 2014, just one day before ECA becomes the daily bread in the region for us all.

Emil Arolski

*Project Manager
LNG in Baltic Sea Ports & Baltic Ports Organization*

*Baltic Ports Organization
c/o Actia Forum Ltd*

Possibilities for the use of LNG as a fuel on the Baltic Sea

By Stefan Jankowski

During the next few years, according to IMO regulations, all vessels must decrease air pollutant in the exhaust gases especially inside emission control areas (ECA).

In 1997 a new annex was added to the International Convention for the Prevention of Pollution from Ships (MARPOL). The main aim of the Annex VI "Regulations for the Prevention of Air Pollution from Ships" is finding a solution to minimize emissions from ships oxides of sulfur (SOx – Fig. 1), particulate matter (PM), nitrogen oxides (NOx – Fig. 2), ozone depleting substances (ODS), volatile organic compounds (VOC) and their contribution to local and global air pollution and environmental problems.

Fig. 1 Emission limit for SOx (IMO, Annex VI, the regulation 14)

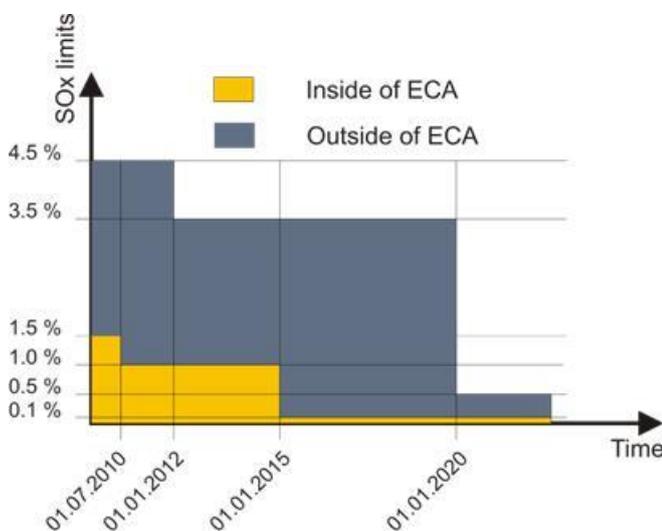
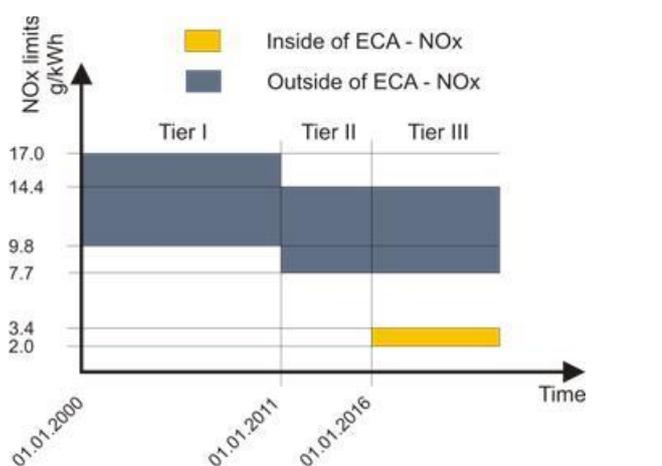


Fig. 2 Emission limit for NOx (IMO, Annex VI, the regulation 13)



Annex VI entered into force in 2005, but in 2008 was revised. The significant tighten emissions limits adopted in 2008, are gradually introduced from 2010.

In addition IMO has adopted mandatory technical and operational energy efficiency measures which will

significantly reduce the amount of CO2 emissions from international shipping.

Currently Baltic Sea and North Sea are established as an ECA only for SOx, but everybody engaged in sea transport business should think perspective. North America and from 1 January 2013 United States Caribbean Sea are SOx, NOx and PM ECA.

There is a high probability that new ECAs will be established (Fig. 3) or that the existing ones will be more restrictive.

Fig. 3 DNV's map of current and possible ECAs (DNV 2011)



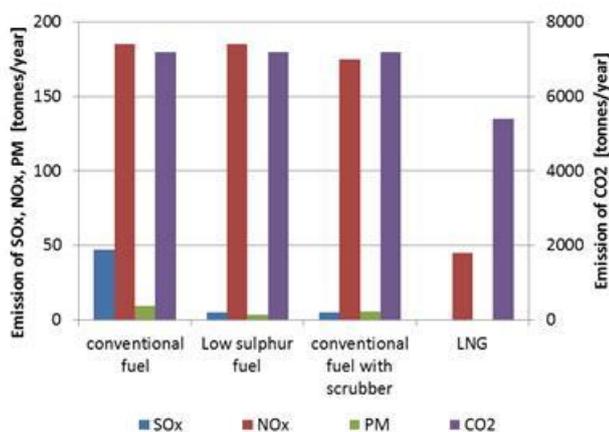
The review of existing engine technology and its development indicates that currently only three solutions are in accordance with SOx regulations. If shipowners wish to continue sailing on Baltic Sea after 2015 they have to choose (DMA 2012).

The first solution, **low sulphur fuel**, require only minor modifications on vessel fuel systems. The content of sulphur in a fuel like MDO (marine diesel oil) and MGO (marine gas oil) can be below 0.1%. The main disadvantage such a choice is limited availability of low sulphur fuel is that rising demand is expected to increase its price uncertainty.

The second solution, **an exhaust gas scrubber**, requires installation of an exhaust gas scrubber to remove sulphur from the engine exhaust gas by using chemicals or seawater. This technology require significant modifications on ship systems. Additional tanks, pipes, pumps, and a water treatment system. The sulphur-rich sludge produced is categorized as special waste, to be disposed of at dedicated facilities. Moreover, scrubbers increase the power consumption, thereby increasing its CO2 emissions.

The third solution is using **LNG** (liquid natural gas) as a fuel. Natural gas is the cleanest form of fossil fuels available (Fig. 4), and when fuelling a ship with LNG no additional abatement measures are required in order to meet the ECA requirements. However, an LNG-fuelled ship requires purpose-built or modified engines and a sophisticated system of special fuel tanks, a vapouriser, and double insulated piping. Available space for cylindrical LNG fuel tanks on board ships has been a key challenge, but new hull integrated tanks are expected to simplify this issue.

Fig. 4 Emissions of different fuel solutions for typical Baltic Sea cargo vessel (DNV 2010)



For new ships delivered after 1 January 2016, exhaust gas purification by Selective Catalytic Reduction (SCR) or LNG fuel are the only two currently available abatement measures to meet Tier III requirements.

LNG means liquefied natural gas. The natural gas is temporarily converted to liquid form at -163° Celsius, under atmospheric pressure. It takes up 600 times less space than as a gas, therefore it is more efficient for storage and transport

In addition LNG is clean not only in aspect of exhaust gases, but also in case of spill. LNG does not cause environmental disaster because in such a case it will evaporate quite fast. The main hazard in case of LNG spill, are frostbites due to extremely low temperature.

Taking account above mentioned three solution it should be said, that LNG is the best alternative in aspect of economic and environmental impact to Baltic Sea.

The cost of a new vessel equipped with LNG propulsion is higher about 10-20% than conventional vessel with similar gross tonnage. The additional cost is mainly due to the sophisticated LNG storage tanks, the fuel piping system and in some cases a slightly larger ship. Based on experience from ships built, the additional investment cost for the LNG fuelled typical Baltic Sea cargo vessel has been estimated to about 4 million USD. Estimated cost of scrubber installation should be around 1 million USD. Taking these assumptions into account and forecasting price of marine gas oil (MGO) in 20 years perspective the lowest exploitation cost are in case of LNG vessel.

In order to enable navigation of vessels using LNG as a fuel, a grid of bunker stations is required. An average period between bunkering for the LNG vessels today is about one week, and vessels should have possibilities to obtain LNG in one of the ports during their trips. Currently the LNG infrastructure on Baltic Sea is very weak.

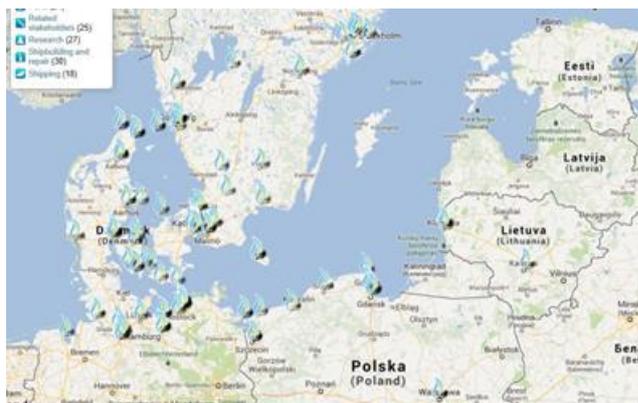
The number of import terminals is not enough to provide a supply of LNG for every route on Baltic Sea. They should operate rather as a hub of LNG and distribute it to small scale bunker stations.

In case of decision about building new import terminal, it belongs to government in order to securing energy independence of given country, but decisions about building small scale LNG terminals or bunker stations, depend on market. Currently there is no LNG bunker stations on Baltic because there are a small number of LNG powered vessels, and lack such vessels is a result of lack of bunker stations. It seems correct that at least at the beginning, the bunker stations should also have a political support.

MarTech LNG – “Marine Competence, Technology and Knowledge Transfer for LNG in the South Baltic Sea Region (SBSR) is one of the projects which aims are dissemination of LNG technology by exchanging experiences, knowledge and competencies within SBSR. The project supports the activities related to LNG technology, promotes LNG as a green energy and the cleanest marine fuel. Main idea of the project is to create a better access to technology and knowledge on LNG related business activities to build up a better competences and specialization among the SBSR maritime business supply chain.

One of the first tasks of the project was region study in terms of existing education, research, training and consulting institutions providing activities related to LNG technology. Based on this analysis interactive map were created (Fig. 5).

Fig. 5 . LNG activities on Baltic Sea



LNG is one of the best solutions for Baltic region to protect environment against pollution caused by conventional fuels. Now is the time for owners to decide which solution to choose to be in compliance with the MARPOL Convention. They will choose LNG, if on Baltic Sea the LNG infrastructure will exist. Unfortunately it seems that without political support, building infrastructure may be difficult.

Stefan Jankowski

Maritime University Szczecin

Poland



Maritime spatial planning – a new layer in integrated marine management

By Gonçalo Carneiro

Six decades ago concerns began to be expressed in the USA about the increasing pace of anthropogenic degradation of many coastal areas. The problem was not only one of growing exploitation of coastal spaces and resources, but more importantly one of lack of coordination of the planning and management of this exploitation. The response came in the form of the world's first statutory coastal zone management programme, codified in 1972, a fundamental element of which consisted in mechanisms for harmonising and controlling the development of human activities at the coast.

Developments were slow in the years that followed, including in the USA. The relevance of cross-sectoral marine management was raised sporadically in academic circles, but concrete action was scant. The 1992 Rio conference proved instrumental in reviving the interest for and a commitment to a global agenda for integrated coastal and ocean management. In its wake, that decade saw important conceptual and institutional developments in both coastal zone management and international oceans governance. In the US the federal coastal management programme was revived, and at the end of the decade the EU launched its demonstration programme to test novel approaches to integrated coastal zone management. The international oceans agenda culminated in 1998 being declared international year of the ocean, something that provided several countries the momentum to adopt national ocean policies coordinating all activities related to the marine and coastal environments.

These efforts at institutionalising integration were not easily matched by a *de facto* transformation in the planning and management of human activities at the coast and at sea. Coastal zone management continued to be bound by the regimes for terrestrial land use planning. Despite successes in some specific environments – e.g. estuaries and coastal wetlands – and in raising awareness of and knowledge about the specificity of coastal environments, coastal zone management has seldom achieved the statutory independence that it once aspired to. Activities at sea, on the other hand, remained largely in their segregated planning paths, harmonisation occurring only in those cases and areas where it proved necessary. Proactive, anticipatory and integrated planning remained – and remains – for the most part elusive.

On the ground, evidence of environmental degradation continued unabated. In global fisheries, for example, the 1990s mark the consolidation and recognition of the decay of most fish stocks, the collapse of the Newfoundland cod fisheries constituting but one in many examples of grossly inadequate fisheries management regimes. Environmental degradation continued to mount in the world's coasts and seas in tandem with growing human population and maritime uses.

The expansion of activities with exclusive claims for maritime space in the late 1990s and early 2000s – notably offshore energy installations – was to revive the long-held interest for spatial planning of sea areas. The concept was not new, as spatial measures had been used to regulate human use of the sea for several decades. Examples included safety zones around fixed installations, regulated fishing areas, or measures for regulating navigation such as traffic separation schemes, areas to be avoided and places of refuge. Also in marine conservation, zoning was a mature concept already then and had been applied to control human activities and the respective impacts on marine ecosystems in different protected areas. The novelty of maritime spatial planning (MSP) as it emerged in the first half of the 2000s was that integrative planning – i.e. one planning for all sectors, instead of one planning per sector – should serve cross-sectoral objectives – i.e. the objectives of all sectors and not only of selected few should be represented in the planning process. Again, the underlying concept of the spatial ordering of the sea was not new

– so-called 'sea use planning' having been discussed at least since the late 1970s – but it was not before the early 2000s that a clear justification and the necessary technology came together and opened what has since been a particularly fertile field of research and practice.

Maritime spatial planning is in many respects an adaptation of terrestrial physical planning to the sea. Some important differences aside – notably that of ownership, which is fundamental to planning on land, but is absent at sea – the two processes share several important commonalities. Both serve to harmonise claims on shared spaces and to steer and control future developments; both should represent the views of relevant claimants and be adaptive to how these change with time; and both should harmonise the cumulate anthropogenic pressure with the capacity of the natural environment, ideally on a scale matching that of key ecosystem elements. The planning process is ideally one that supports the resolution of incompatibilities between different claimants in both space and time for the benefit of society as a whole. A key end product is a spatial representation of current and future uses of the sea.

Methodological developments in MSP have proceeded at a fast pace in the last half a decade, propelled largely by academic institutions. Pilot and research projects have emerged throughout Europe, which has been at the forefront of this development. Several states have also engaged with MSP, but only in very few cases has this evolved into statutory processes. Larger-scale initiatives, such as that of the US and Canadian federal governments and of the EU – where a joint coastal management and MSP directive was proposed last spring – have so far exhibited limited progress, be it for lack of interest, insufficient preparation, or outright opposition by member state governments.

Industry has shown varying commitment. While sectors such as offshore wind and to a lesser extent offshore mariculture have been keen to promote MSP as a means of securing space for their own development, the more traditional sectors for which freedom of the seas remains paramount and which have traditionally held a privileged role in maritime space allocations maintain a cautious distance to MSP. Initiatives are in place at different scales to engage industry in MSP – that of the World Ocean Council being one of the most prominent – but it remains to be seen how they succeed in attracting shipping and fisheries to the MSP table.

The current impetus to MSP carries both risks and benefits. An important risk is that it diverts attention and resources from other marine environmental measures that remain urgent, notably those pertaining to the impacts of land-based activities and of climate change. On the other hand – and this is what this text has tried to highlight – if one regards MSP primarily as a process for harmonising different interests with one another and with the carrying capacity of the marine environment, it will benefit the long-standing commitment of marine environmental managers worldwide towards integrated management of coastal and marine resources.

Gonçalo Carneiro

Programme Manager / Consultant

NIRAS International Consulting
Stockholm

Sweden

e-Navigation – a key for safe, efficient and sustainable shipping

By Michael Baldauf

Ensuring and increasing safety

'Baltic Ace' – 'Corvus J', 'Almeria' and 'Lisco Gloria' four ship names each of which stand for a sample case of an accident: a collision, a grounding or a fire on board ended up in the successful evacuation of all passengers but the total loss of the ship – three sample accidents that recently happened and are in our minds when we think about the future of sea transportation. The International Maritime Organization (IMO) aims for safe, secure and efficient shipping on clean oceans. Research and technological development is looking for solutions to avoid accidents. However, although there are numerous sophisticated safety systems installed on board ships as well as ashore in dedicated traffic management centres in order to avoid such events or to minimize the consequences of any accident, the number of accident seems to constantly remain on a high level. Between 2004 and 2010, each year approximately 100 accidents happened only in the Baltic Sea. Are the safety systems not sufficiently appropriate to support captains, pilots, navigating officers? How can e-Navigation help to increase safety and simultaneously contribute to make sea transportation more efficient and environmentally friendly? e-Navigation is a holistic concept defined 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.'

One of the aims of e-Navigation is to harmonize and to standardise systems to ultimately make the mariners' job easier, therefore reducing the risks of collisions and groundings and to avoid pollution of the marine environment respectively. It should be realised by integrated onboard navigation systems "that benefit from integration of own ship sensors, supporting information, a standard user interface and a comprehensive system for managing guard zones and alerts." It is quite obvious that such systems will have strong effects on safety of navigation and the protection of the marine environment as well.

In the last two decades a number of technological improvements addressing specific safety related aspects. New pieces of equipment and enhanced and sophisticated systems were introduced onboard and ashore as well to primarily contribute to more safety. We can mention e.g. Automatic Identification Systems (AIS), we can refer to the introduction of Voyage Data Recorders (VDR) and Simplified Voyage Data Recorders (S-VDR), on Integrated Navigation Systems (INS) and Integrated Bridge Systems (IBS) and many more pieces of equipment that are today state of the art. Maybe Electronic Chart Display and Information Systems (ECDIS) can be seen as one of the major cornerstones of all these developments and systems that have been introduced rather as sole and stand alone systems but need to be integrated all together into an overall framework in order to make them working and performing at its best and to materialize the inherent potentials – like making all the instruments of an orchestra sounding perfect. The e-Navigation concept is exactly about this and is to help all the human operators on board the captains, pilots, navigating officers, engineers or the VTS and SAR operators ashore to fulfil their tasks they are responsible for.

e-Navigation – bringing together technical systems and human operators

e-Navigation applications like e.g. enhanced anti-collision displays, dynamic tidal and current information integrated into ECDIS but also completely new services as e.g. route broadcast and rote suggestion services for enhanced traffic management and coordination are about to be developed, demonstrated and tested. However, it is very well recognized that also training requirements

will rise. From ongoing research it is concluded that there is a need to pay attention not only to the potentials of the new systems and their options to display and highlight safety related objects but moreover and particularly also to the constraints and the corresponding consequences for sophisticated presentations including processed and linked information and even warnings and alarms. The operators must be much more aware and must know about the details of the limits of any system used for navigation.

From research projects like e.g. ACCSEAS it has become obvious that the users e.g. wish to have more sophisticated harmonization of alarms and warnings when navigating in shore-based monitored areas. Warnings triggered by the collision and grounding avoidance system ashore and onboard must be harmonized in order to avoid confusion and unnecessary communication. The minimum level of harmonization should be in using harmonized approaches when training and educating the end users. On the other hand as e-Navigation also addresses harmonized presentations, users support the idea of standardized human-machine-interfaces. Research clearly proves that standardisation helps to make training more efficient than it is today, when e.g. type specific training is required for certain pieces of equipment.

New technologies have to be integrated into the training programs. In the European ADOPTMAN project new enhanced manoeuvring support modules have been developed and tested in a ship-handling simulator environment and lead to the parallel development of new tools to enhance the training and education. e-Navigation will not only make use of modern simulation-based functions but also will improve training and education as well. In the 'TeamSafety' project a multi-dimensional simulator has been developed in order to improve team training for maritime safety related subjects for complex scenarios as e.g. a fire onboard a RoRo-Passenger-Ferry that also includes the actions to prepare the evacuation and coordinate the shore-based support.

Conclusion

The e-Navigation concept is obviously a driving force for safe, efficient and sustainable shipping in the future. It not only effects technical and technological developments but also maritime education and training. The research partners, dealing with the ambitious e-Navigation concept, need to also consider the training issues. ACCSEAS and other e-Navigation related projects are therefore continue their work with further surveying and studying the situation and want to develop ideas and derive suggestions and recommendations on how to design e-Navigation training in order to materialise the benefits and to make the new services working efficiently from the very first moment of its introduction into the real world.

Michael Baldauf

*Dr.-Ing, Associate Professor
Maritime Safety and Environmental
Administration, Chief Instructor
Maritime Simulation*

*MaRiSa – Research group
'Maritime Risk and System Safety'*

*World Maritime University
Malmö*

Sweden



The international legal framework of MONALISA

By Proshanto K. Mukherjee

MONALISA is the acronym for Motorways and Electronic Navigation by Intelligence at Sea. It is a visionary concept designed to make a tangible contribution to maritime transportation in terms of safety, efficiency and environmental protection. It has a two-fold objective: one aimed at contributing in a concrete way to safe, efficient and environmentally protective maritime navigation and the other to focus specifically on EU strategy in the Baltic Sea Region.

The work relating to the legal framework of the MONALISA project was spearheaded by the Swedish Maritime Administration (SMA) and the research and preparation of the report was undertaken by the author of this paper a Professor of Maritime Law at the Faculty of Law of Lund University assisted by Olena Bokareva, doctoral candidate and Nut Sillwatwinyoo, LL.M. graduate. The report is very comprehensive and the discussions on the multifarious issues are detailed and thorough. The project itself is technologically highly innovative which poses challenges to the traditional and well established legal regimes pertaining to sea navigation. The report addresses the relevant issues by recognizing the formidable hurdles and attempts to overcome them through critical legal analysis.

The salient features of the MONALISA Project are depicted through four activities. These are as follows:

- Dynamic and Proactive Route Planning (DPR) otherwise known as “Green Routes”;
- Electronic Verification of Officer’s Certificates;
- Ensuring the Quality of Hydrographic Data on Shipping Routes and Areas;
- Global Sharing of Maritime Data.

The central core of DPR, and in essence, the MONALISA Project itself, is the concept of sea traffic management (STM) which is akin to air traffic management (ATM). It is anticipated that STM will offer a new service facility known as the Sea Traffic Coordination Center (STCC), similar to air traffic control centres (ATCC) in aviation. The STCC concept will provide new processes and methodologies for communication of information between ship and shore, and ship-to-ship. Apart from DPR the second, third and fourth activities mentioned above are equally significant. This Report focuses only on the legal issues relating to the salient features of MONALISA.

One of the key concerns regarding the acceptance and implementation of MONALISA internationally is the potential conflict with certain aspects of UNCLOS particularly in relation to the notion of freedom of the high seas and flag state sovereignty over its vessels on the high seas. Closely associated with UNCLOS issues pertaining to the rights of coastal, port and flag states are issues relating to maritime safety and protection of the marine environment. While UNCLOS provides the basic legal framework for both these matters, the specifics are contained in the two principal IMO Conventions SOLAS and MARPOL. In particular, the SOLAS provisions dealing with navigational safety, have an impact on key aspects of MONALISA since SOLAS largely contemplates control of high seas navigation being in the hands of the shipboard navigators whereas MONALISA envisages the concept of

DPR which is a shore based advisory system but final navigational decisions are left to be decided by the ship master. The object is to improve navigational safety and minimize environmental damage through the institution of “green routes”. There are also implications for the application of the COLREGS.

Another area of potential concern is the second activity mentioned above which can be viewed as an intrusion into the flag state’s exclusive authority over certification requirements of officers serving on board its ships. However, the end objective of this activity like the first one is to facilitate maritime safety and not to cause an impediment. It is well-known that human error is a primary cause of accidents at sea and that inadequate seafarer qualifications contribute to accidents and environmental damage caused by ships. In monitoring seafarer qualifications MONALISA introduces the concept of the smart card which despite a potential conflict with the existing regime relating to seafarers, can be of great practical usefulness. This innovation has implications for the application of the STCW Convention and the newly adopted Maritime Labour Convention.

Through the MONALISA Project there can be better quality of hydrographic data for the use of ships which in turn can contribute to better navigational safety and protection of the marine environment. Indeed, global sharing of all maritime data serves the same purposes globally as well as in the Baltic Sea Region. The potential conflicts of MONALISA with the extant international legal framework are not irreconcilable. The ultimate aim of MONALISA is consistent with the objectives of the international maritime community to promote maritime safety and protection of the marine environment, and therefore, it should be viewed in positive light by all concerned, especially the international bodies responsible for shipping and its legal framework.

Given the fact that the project encourages and instigates the global community concerned with maritime safety and environmental protection to recognize the legal implications of this technological advancement in the field of sea navigation, it is hoped that new avenues will emerge that will reconcile the innovations with the traditional legal regimes which govern navigation at sea at the present time. The role played by Sweden as a Baltic Rim state in this MONALISA initiative is an inspiration to all and the contribution of the Lund University Law Faculty to the realization of this aspect of the project is exemplary and intellectually rewarding for the author and his two associates who have assisted in the work.

Proshanto K. Mukherjee

Professor

Lund University

Sweden



Using modern web-based solutions in connecting marine industry professionals

By Mikko Varjanne

People are used to using web-based solutions in their private life over the years since Internet and web-shops have matured. It is pretty safe to say that you are one of the persons who are already used to using different online tools in your private life. The reason for saying this so confidently is because it applies to most of the people.

Nowadays companies are able to serve their clients' needs better by utilizing modern Internet solutions, information reachable by web-services and being active in the online world. Many shops and services are available easily online without the loss of precious time and energy, regardless of time of day and place. What once was consumers searching for a physical place to buy goods is now searching for the product itself. Why search for a company that makes or sells coffee makers, when you can search for the coffee makers themselves and find multiple solutions from different companies to take your pick? It is easy to understand, if thinking about the standards of today. The demand for these kinds of solutions is easy to see, when simply reflecting your own life. Intensive work life, pressure to accomplish in short time and price-consciousness are rather common characteristics for today's individuals.

The individuals meet this same phenomenon at work. Professionals work with tight time schedules and tight budgets which create constraints but still the tools remain quite the same. This is the case at least in the industries where processes have stayed the same for decades. Old and proven methods create certain standard and sometimes it is hard to see outside the box.

Telex and its later version telefax revolutionized the ways of written communication in the modern business world especially when they were a norm in the 80's. Later, Internet and emails enabled mass delivery of information. This led into environment where we are today, the amount of data and accessible information is enormous. For an individual, this mass of information might create difficulties in chaos-like information flood. However, the more mature Internet becomes, the better the information can be filtered. Like consumer's way of shopping, business information can also be handled in an effective way.

Maritime industry is a business, where standards and regulations give strict directives to shipbuilding and ship operations. Material manufacturers, sellers and service providers need to know and follow these regulations in order to serve the industry. Sourcing and selling in this special niche industry has been expensive and time consuming in global and scattered environment. This has caused, in some cases but not always, an overlapping value chain, which creates higher costs and consumes time and loss of information in the process. Transparency, easy access to verified information, concentrated marketplace

and low cost tools, which are well known and proven in the business to customer -environment, can help even in the business to business environment.

Like a home owner, who wants to source for a new home, an industrial buyer should have a free tool to make sourcing easy and fast. Homeowners go to geographically selected portal, or in global business, to a niche portal such as vacation home portal. The buyer usually is prepared to spend money and therefore should have a free access to data given by those who have products and services to sell to the buyer in need. An open marketplace, with as low transaction costs as possible can create the transparency and efficiency needed. Supply can meet demand, without non-value adding middlemen. Looking at the value chain with holistic perspective, the value is added by the manufacturer of a product and the service is given.

Keeping these simple needs in mind, we have created a modern solution to arrange the data in the industry. SHIPSU is a web-based service, which has many roles in the maritime industry. It is an open marketplace for the shipbuilding and marine operation professionals. Open information about products and services with references and specifications like in a web-shop usually seen in business to customer sales, SHIPSU creates transparency in a unique way.

For a company making purchases in the field of maritime industry, tools like this makes it possible to source for even the most customized solutions from a large global network of providers. On the other hand, providers of maritime services and products can have a cost-effective tool to meet the demand. In addition, collecting big data from different operations done in the internet and in the service can be beneficial, when used properly for customers. Naturally the change to a completely web-based sourcing solution can take a while and, that is why also a professional team available to aid in the sourcing process is needed behind the service.

SHIPSU has a consistent goal to be the world's largest database for maritime industry products and services with nearly 100 000 products to be sourced by a network of nearly 75 000 buyers in thousands of industry's recognized organizations. This will not happen in weeks or months, but follow us to see it happen in the near future.

Mikko Varjanne

*M.Sc. Economics
Chief Operative Officer*

SHIPSU.com



Containership gigantism – reaching the limits of uncertainty

By Raphaël Baumler

In July 2013, the largest containership ever began its operations. Once more and since 1996, the Danish company Maersk sets containership standards by launching triple-E class which means "Economy of scale, Energy efficient and Environmentally improved" design. Soon after, other companies declared their intention to embrace the race to gigantism. For the time being, this strategy of economy of scale seems successful. The Ultra Large Container Ships (ULCS) category is expanding in size and number. An economic approach (reduction of container slot price) combined with an environmental communication policy (reduced air emissions by slot) justify this tendency.

However, ULCS ships do not exist in isolation; they integrate existing transportation systems having their own inherent restrictions. Indeed, to benefit from their size, each segment of the supply chain must acquire the appropriate dimension to accompany the move to gigantism. In short, ULCS forces landside adaptation in order to maintain smooth and efficient flow of operation. Ports need to be geographically shaped and prepared to accept such monsters. Berth and storage facilities, appropriate port equipment, and adequate structures are vital to avoid impairing the expected competitive advantages of ULCS. The need to adapt the complete transportation system combined with geographical and technical constraints have serious impact on ULCS operational flexibility. Today, few ports meet ULCS demands. So optimized operations are difficult to achieve in many other ports. Consequently, the range and possibilities of deployment of such ships are reduced. To cope with the shipping gigantism, large port and hinterland investments are required to avoid cargo supply disruption and to optimize load as well as reduce excessive time in ports. But, unlike shipbuilding, port modification and supply system transformation may take years and considerable efforts in many countries. This situation may destabilize the adequacy of port and ship dimensions.

In addition, intrinsic uncertainties on ship's load may endanger their resilience. Effectively, the present container trade is characterized by a permanent inability to accurately assess cargoes, particularly in terms of weight distribution and container contents. Several casualties have demonstrated the lack of consistency between the actual cargo declaration and the real content of the containers. After the 2007 foundering of the *MSC Napoli*, the investigation conducted by the Maritime Accident Investigation Branch (MAIB) in the UK unveiled, *inter alia*, that 20% of the containers analyzed "were more than 3 tonnes different from their declared weights." With such levels of uncertainty on container weights, total cargo weight and distribution of masses on board cannot be established with confidence, which jeopardizes the risk management on ships. Despite their quality, the on-board computerized loading systems reach their limits with data quality inputs. Without proper supervision possibilities, the crewmembers in charge of the safe loading become blind and have to rely on unverified data. Therefore, the seafarers are unable to adequately assess and manage the risks associated with the cargo. So, despite the onboard efforts to preserve ship's stability and integrity, the weights distribution uncertainties affect the overall strengths applied on the ship structure and raise the level of risks. Repeated over time, this situation may endanger the ship resilience and endanger the ship itself.

Other investigations following incidents and accidents showed that other serious issues affect containerships.

Misdeclaration of dangerous goods constitutes one of the main risks affecting safety. Fire and explosion causing extensive damages have been observed. In addition, several security issues have been documented. In this respect, in its 2012 report on Maritime Transport and Destabilizing Commodity Flows, the Stockholm International Peace Research Institute (SIPRI) highlighted the growing use of containerization to traffic of arms. SIPRI declared that control deficiency in the container trade permits unlawful activities to flourish. Drug, waste and human trafficking have also been reported. Moreover, on larger ships, the amount of containers carried increases uncertainty levels and may seriously affect ships' resilience – e.g. the absolute weight gap between declared and existing weights increases mathematically with ships size as well as the potentially harmful contents locked behind container doors. Coincidence or misfortune, during the first half of 2013, two of the largest ULCS suffered casualties - engine flooding on *Emma Maersk* and container fire on the *Eugen Maersk*; and two serious disasters affected container shipping during summer 2013 – the split and sinking of the 2008 containership MOL Comfort in June and the total loss of the Hansa Brandenburg after a fire in July. These consecutive accidents question the safety of poorly regulated traffic of containers.

The inconsistent or lack of controls of container weights and contents find its reason in the willingness to avoid trade disruption. In the investigation report on the *Annabella* in 2007, the MAIB summarized the issue: "While key industry players will attest that safety is of paramount concern, evidence obtained during this and other MAIB investigations into container shipping accidents suggests that in reality, the safety of ships, crews and the environment is being compromised by the overriding desire to maintain established schedules or optimize port turn round times."

In conclusion, the economic and commercial calculation justifying gigantism may be caught up by world realities. Unsuitable transportation chain and inadequate container control may generate serious operational hazards. Without adequate integration of uncertainties affecting the container trade, proper risk management mechanisms and mitigation measures cannot secure nor ensure ship safety and security. In this respect, industry leaders and countries demonstrated their willingness to solve some issues related to misdeclaration of containers during the last meeting of the Sub-committee on Dangerous Goods, Solid Cargoes and Containers at the International Maritime Organization in September 2013. While the industry tends to gigantism and therefore require an ever increasing level of accuracy in its operations, the identification, assessment and management of uncertainties become paramount for vessel safety and environment protection as well as for business preservation.

Raphaël Baumler

Dr., Associate Professor

World Maritime University



The current and future needs of postgraduate maritime education

By Neil Bellefontaine and Ilias Visvikis

During the last few years, following the financial crisis that led to the amplification of the risk exposures and volatility in the market, to the decrease of profitability, and to the magnification of competition pressures, the shipping industry has recognised the need for maritime professionals with specialised knowledge and skills, following the international standards and practices, that they will further contribute to the development of the industry.

The specific need is directly related with the structural changes that have occurred in the international shipping industry, where maritime professionals must cope with the excessive competitive environment, take important decisions under a limited amount of time and with insufficient information, follow newly-established safety and security regulations, design fleet employment and chartering strategies that aim in cost minimisation, and follow the business cycle by timing the purchase and sell of expensive assets (vessels), amongst others. It has become clear, more than ever, that in order to meet such needs and requirements, academic knowledge should be combined with the practical experience. A postgraduate degree, can, therefore, reassure that maritime professionals have the theoretical expertise and academic education that together with their practical background to undertake efficient decision-making in the shipping industry.

Furthermore, this need has become rather a necessity, as with the freight rate market at historical lows, with the bunker fuel prices - representing about 60%-70% of operating expenses - at unprecedented highs, and with vessel prices depleted, profitability has been deteriorated. Topics, such as, commercial and technical risk management, investment appraisal and alternative sources of shipping finance, mergers and acquisitions, fleet and routes optimisation, cost-effective budget control, energy efficiency, corporate social responsibility, and maritime sustainability, among others, have already ranked highly in the agendas of practitioners operating in the shipping environment around the world.

Postgraduate degrees have become a common necessity in the last few decades. A postgraduate degree in the maritime field can safeguard that the above topics are covered in detail, that the required education is assessed, and that knowledge is widely disseminated across the shipping industry. Such degrees should be able to apply the acquired theory into business practice. Research should also be part of the curriculum of such degrees, as research results today lead the changes and the new knowledge creation of tomorrow.

As an example, the World Maritime University (WMU) serves for the past three decades as the apex institution of postgraduate maritime education and research for the sake of human capacity building on behalf of the 170 International Maritime Organisation (IMO) Member States (www.wmu.se). WMU aims to be the best postgraduate University for maritime education and research, and endeavours to educate the maritime leaders of tomorrow.

As of 2013 WMU has to date graduated 3,657 students from 164 countries.

Today, WMU is an institution that provides its students with privileged access to and understanding of the operation and decisions of IMO; an institution where over 100 international experts and professionals – both resident and visiting staff – from around the world provide a high-level education and research network; an institution which gives its students direct and extensive access to the most modern technologies and methods in marine transportation and administration used in the industrial world; an institution which carries out a wide range of maritime research, with many projects involving partners from around the world; and an institution at the centre of the global network of maritime institutions, experts and practitioners. These are the attributes that make postgraduate education at WMU unique and have the highest essence for the global maritime community.

Moreover, since 2006, WMU has led approximately 90 Professional Development Courses (PDCs) for almost 2,000 maritime professionals in various locations around the world, providing mid-career updating and knowledge sharing for maritime professionals. The blend of academic expertise and hands-on practical experience can be immediately applied in the workplace. Finally, to further cover the aforementioned needs, WMU is considering plans to launch in partnership with two other universities an Executive MBA in Shipping (EMBA), with the aim to provide motivated and skilled graduates for the maritime industry, prepared with the abilities, and knowledge needed to compete in the shipping industry. The EMBA program will combine operational training in shipping knowledge with the use of managerial theories and practices. The graduates of such a postgraduate degree will be ready and well equipped to staff managerial corporate positions in the wider maritime cluster.

Neil Bellefontaine

*Professor, Vice President
(Academics)*



Ilias Visvikis

*Associate Professor
Director of Executive and
Professional Development*



World Maritime University

Current trends in the Polish maritime industry

By Urszula Kowalczyk

Development of maritime sector in Poland is influenced by several factors, especially the globalisation and integration processes in the world economy and seaborne trade. Fluctuation observed in recent years in the world shipping had significant impact also on Polish maritime economy.

The problem of SOx emission is a hot issue for the whole maritime sector and Poland is no exception. The costs of adapting the tonnage to new regulations are very high, for example installing the scrubber is up to millions of 5 million PLN. Not only shipowners have to face the challenge, but also sea ports will be forced to introduce adequate technological solutions. The adaptation of different technologies, the cost of installations, cost of fuel production and the reaction of fuel producers have are of key importance for Polish ports considering their determination of changing the cargo handling structure.

Following the increasing global interest for LNG as an alternative fuel, also Polish ports and maritime transport operators have to challenge the high costs of ships deployed in ECA areas, increasing costs of transport services, shift of cargo from sea to land transport means, decreasing competitiveness of local and regional carriers on the benefit of global carriers and especially with the probability of less interest in Polish sea ports and more focus on the South European ports.

The Port Authority of Szczecin/Świnoujście is participating in the largest Polish project focused on energy supply – the LNG terminal in the port of Świnoujście. The LNG terminal in Świnoujście shall be completed before the end of 2014. The terminal will be prepared to receive natural gas carried on board of ships from any part of the world. There are over 22 such terminals operating in Europe. The terminal in Poland will be the only such installation in the South-East Baltic region. The terminal will be prepared to receiving and regasification of liquid natural gas.

The construction of LNG terminal in Świnoujście includes also bunkering facilities and a special gas storing tank will be constructed. The investment shall be rewarding within the next years and that is also the point of view of other Scandinavian and West-European ports, where the ships will be fuelled and smaller gas tankers supplied with gas to be further distributed to smaller ports.

In line with global trends in maritime transport Polish ports are focused on adapting their cargo handling capacity and port infrastructure to the market requirements. Container terminals in Polish ports are developing their capacity and investing in modern equipment. Deepwater Container Terminal in Gdansk is a questionable leader among Polish container terminals.

In 2010 the container turnover in DCT Gdansk grew by 180% and the terminal became one of the fastest growing terminals in the world and in January 2011 one of 15 strategic ports of Maersk Line. In 2012, DCT container handling grew by another 40%, to nearly 1 million TEU. Already in 2011, when Maersk Line's first E class type vessel Emma Maersk called DCT Gdansk, the carrier and the terminal set a new standard for servicing the Polish market and introducing innovative solutions in cargo transport. In August 2013 DCT Gdansk was hosting the world's largest container ship - the first Triple-E class ship Mærsk Mc-Kinney Møller on her maiden voyage from Asia to Europe. It proves that DCT Gdansk is ready to service ultra-large container vessels in the Baltic Sea region. The event can also be considered as an unquestioned milestone for the entire Polish container business. Poland has become an important link in the transport chain connecting Central and Eastern Europe with Far East. Being one of only

14 world's ports capable of handling the Triple-E, DCT Gdansk confirmed its role as the major Baltic hub port.

The development plans of DCT are focused on building a 2.5 million TEU extension, which will increase the terminal's total capacity to 4 million TEU p/a by 2016. This will place Gdansk among the top-10 ports in Europe able to serve the new generation of largest vessels in the world from both Maersk Line and other carriers.

The Port of Gdansk and DCT in particular, have also a unique chance of development in relations to the sea-land transportation corridor linking Northern and Central Europe and subsequently linking both Southern and Eastern regions: the Balkans and Turkey. Also the on-going construction of the Pomerania Logistics Centre, will be highly beneficial for DCT. Thanks to that corridor, of which the ports Gdansk/Gdynia are important nodes, as well as the motorway A-1 and the rail lines E-65 and CE-65, many industrial centres along the corridor will gain an access to those ports and to many nodes abroad, especially to landlocked countries, like Austria, Slovakia or Belarus.

The port of Gdansk investment activities include also the construction of storage facilities for liquid fuels and oil derivatives. Following the agreement with the Belgium operator "Sea Invest" and the British company "Arcelor Mittal", a dry-bulk terminal ultimately dedicated to the distribution of both exported and imported goods across the entire Baltic Sea region has been decided. The considerable potential for growth in the deep-water part of the port through the construction of new piers on the land reclaimed from the sea will enlarge the port's dry bulk cargo handling capacity up to 12 million tons p/a

The current deep crisis in the shipping sector is forcing the shipbuilding business to look for other field of activity. Polish shipyards, like other European giants, have lost their competitive position, but they are still involved in the construction of smaller vessels and supply units. The ship repair sector in Poland has been more resistant to the impact of the turns and twists of the shipping market, in comparison with the Polish former national pride - the shipbuilding industry. Currently the most profitable business is in offshore and wind farm constructions. The company Remontowa Group, along with several affiliated companies and subsidiaries, is the leader amongst European ship repair yards and a major player on the world market, specialized in ship repairs and conversions, design and construction of new ships, offshore units and steel structures. Every year, over 200 vessels and offshore units from all over the world, are repaired or converted at Remontowa. In 2010 and 2011 it has been listed the third in Europe (after Germany and the Netherlands) with 10-11% share in European market.

Despite several obstacles in the world shipping environment, the performance of Polish maritime sector, especially the port,s in recent years is satisfying and their financial results are reflected in new investments and development of infrastructure.

Urszula Kowalczyk

Head of Economics and Law Department

Maritime Institute Gdansk

Poland

Maritime sector stakeholders and new regulations

By Alari Purju and Eva Branten

The article applies the typology of stakeholders to discuss governance issues of maritime sector. In very general terms stakeholder is any agent (individual, group, organization, public institution etc.) who can affect decisions of other agents or is affected by their decisions. The classification based on three attributes, legitimacy, power and urgency, is applied here. The legitimacy is attributed to stakeholders that have a legal, moral or presumed claim on the issue. Power belongs to stakeholders who are in a position to influence the decisions of other agents. The urgency is related to a possibility or to a need to demand immediate attention due to crucial impact of respective issue on the results of agent's activities. To be a stakeholder means that there is either a legitimate claim, there is an urgent problem or crises which should be solved and there is more or less power to influence respective decisions. The position of different groups of stakeholders is dynamic. Situation, changes in political system and also regulations could change nature of the claim of one or another group of stakeholders. The stakeholders themselves are active in improving their position.

The legal framework for vessel traffic is tightening, the sulphur emission regulation which will be introduced from 2015, giving the most recent example. The main regulation which will be adopted with this directive is that the proportion of sulphur in fuel should be not more than 0.1%. The limit has been 1.5% up to 2010 and 1.0% after 1.7.2010. The requirements introduced by the sulphur directive have been an activator of stakeholders and are considered here as an important aspect in depicting position of stakeholders in maritime sector. The article uses the structure of Estonia's maritime sector stakeholders as an example.

The definite stakeholders are those who possess power, legitimacy and urgency. The definite stakeholders in Estonia's maritime sector are government agencies for the reason that they have power and legitimacy to act and also urgency is related to the need to introduce respective legislation which is foreseen by international commitments. The shipping companies are definite stakeholders in relationships with other partners in the maritime sector because their decisions on shipping lines are framing crucially the flows of traded goods. Especially important are the routes of ocean lines in framing the global cargo flows. The ports visited by these shipping lines are destinations of reframing transport flows into smaller lines and cargo handling companies adjust wishes of their clients about ports of arrival of goods to availability of options provided by shipping lines.

The expectant stakeholders are those who possess two of the three attributes and imply more active relationships with the company. Ports, cargo handling and shipbuilding companies are all in different ways dependent on the new requirements. Ports have to develop new infrastructure to serve waste treatment. Cargo handling companies have to adjust their services to new conditions taking into account also additional costs. They have to be ready to redirect trade flows from sea to land with increasing share of car transportation from and to continental Europe. Shipbuilding companies should develop new products taking into account new technical conditions. All these industries have legitimacy of claims because the new regulations have a quite substantial impact on their business activities. They all are legitimate stakeholders with urgency claim, but with limited power to enforce it. Building of alliances and appealing to the values of decision makers are their relevant strategies and for that reason they are dependent stakeholders. At the same time they have certain limited tools to have influence on certain decisions. State-owned ports are important sources of tax revenue and they have some power in economic decisions which have impact on other companies (sale or rent of capacity for terminals). Cargo handling and shipbuilding companies create also tax revenues, provide employment and demand for services of other industries. Local governments have impact on certain concrete decisions like sale or rent of additional land for ports. At the same time, they are dependent on tax revenues (income tax connected to inhabitants of local government and land tax connected to its territory) created

by these business activities. Associations of Maritime Sector related activities are urgency and legitimacy of actions because they represent companies which are very directly influenced by the new regulation. They have access to government agencies but their direct power is limited and they can act as a lobby group intermediating information between the government agencies and companies. Local communities and environmental groups have urgency and legitimacy for actions but their impact is even lower and they could make their voice heard through local governments or state agencies.

The latent stakeholders possess only one of the attributes – legitimacy, power or urgency. In Estonia's maritime sector trade unions, citizens and academic institutions are actors with legitimate claims but without power or demand that require immediate actions and they are for those reasons stakeholders at the discretion. Citizens have the claim to environment conditions, including conditions of sea, but their direct impact on solutions is limited and their demands could be considered first of all if they were presented by intermediating bodies. The environment related problems are urgent for local communities living in areas close to the sea coast or/and industrial constructions of maritime industry. Academic institutions have legitimacy and obligation to examine environmental conditions and develop technology for industries, but their impact depends on access to political decision making and urgency for particular businesses.

Media belongs to the subtype of stakeholders with relative power. At the same time the faith of maritime industry is not an extremely urgent topic for media and as there could be only medium to long term processes dealing with critical issues and providing solutions, the media is very often not patient enough to go into details. That makes from media a dormant stakeholder, that is, to the extent they are willing or able to use their power. Tourism industry is dependent on certain services provided by the maritime sector but for them also substituting products are available. The future generations naturally have legitimacy for reliable environmental conditions but especially in the countries with relatively pragmatic short and medium term approach to business activities and the related use of natural resources the urgency and power are limited in taking into account of their interests.

The agents related to maritime sector activities have to take into account new conditions. The legal framework for vessel traffic is tightening. Current fleets need to be reviewed and renewed, which means getting rid of old tonnage and making sure that the rest meets the new demands regarding environment and fuel efficiency. This means retrofits, conversions and new buildings, which again provide business opportunities for the shipyards in the region. These business activities are dependent on different public services and regulations like safety and security related services and regulations, environmental conditions related issues (regulations and required improvements in technology). One impact of this dependence is that a big number of different stakeholders are involved and would like to see their values and preferences followed in governance process. Clarification of positions and possible roles of stakeholders makes visible rules of the game and patterns of possible outcomes.

Alari Purju

Director

Eva Branten

Research Assistant

Department of Logistics, Tallinn University of Technology
Estonia

SmartComp – Finnish perspective through national consultation days

By Sari Nyroos

SmartComp - Smart competitiveness for the Central Baltic region project aims to unite the maritime clusters of the region, i.e., Estonia, Finland, Latvia, Sweden, and to strengthen existing networks as well as to create new ones in order to improve competitiveness of the sector and to create sustainable growth possibilities for the sector through triple helix cooperation. The strategic focus of the SmartComp project work package three is to create fruitful environment for companies to cooperate and innovate in the Central Baltic maritime cluster. The work package three, led by University of Turku/Centre for Maritime Studies, comprises organizing of two international and six national (two in Estonia, Finland and Latvia each) SmartComp consultation days. During these consultation days the participants brainstorm for new ideas on promoting competitiveness of the maritime sector in the Central Baltic region. This article focusses on the Finnish national consultation days' discussions and conclusions.

The first Finnish, national SmartComp consultation day was arranged in Turku on May 27, 2013, analysing the Finnish maritime cluster strengths and competitive assets. As a result of group discussions it was concluded that the Finnish maritime cluster's competitive advantages are based on comprehensive, broad knowhow, including material and equipment technology, engineering and specialized knowhow. In addition, project management with smooth and reliable deliveries can be considered as a particular strength.

Whereas, weaknesses of the Finnish maritime cluster, based on consultation day group discussions, include the incoherence of the cluster and the fact that companies are more and more led by foreign owners with entirely economic interest. Further, it seems that even too much effort is put on the high product standards, when volumes, however, make more difference in the global markets. It was widely considered that the public funding system should be developed to better support the companies. In addition to the fact that the funding system appears to be highly fragmented, the processes of utilizing it are far too complicated for SMEs, in particular. The system should be developed in order to be able to practically support companies to swiftly establish new inventions.

Another issue dealt with in the Finnish national consultation day's group discussions in May was the question on possibilities of utilizing the Central Baltic region cooperation in order to strengthen the national maritime cluster. It was discussed that there are several Finnish companies operating in the Central Baltic countries and vice versa, but little attention has been paid on expanding the cooperation across the countries. Green and arctic technologies, for example, were mentioned as possible areas of expanding the cooperation. The key issue discussed, however, was that improving and developing the cooperation within the national cluster should be the priority, first. The networks should not be based on traditional subcontracting chains, but encouraged to function in more horizontal cooperation. The whole business culture should be changed to become more open and encouraging towards innovativeness, seeking for new production technologies.

The second Finnish, national SmartComp consultation day was held in Turku on September 19, 2013. The cooperation potential between maritime industry companies and research institutes in a national perspective, as well as national maritime cluster cooperation as an asset to conquer global markets were discussed.

The second consultation day was chaired by professor emeritus Pentti Häkkinen, opening the day with his own presentation and views on maritime cluster competitiveness. Competitiveness, in particular, is the key question when talking about preserving jobs on national level - whether in high-level expert positions or jobs in production - this is what professor Häkkinen brought up right in the beginning. The working group investigating the competitiveness of the Finnish marine industry

considered the arctic knowhow and offshore industry as the most potential fields to base the future perspectives on. Professor Häkkinen stated that these are both worth putting an effort on, but should not be entirely trusted on, bearing in mind the tight competition in the target markets. Further, the working group puts emphasis on the Finnish marine industry network concept as a particular strength. Even there professor Häkkinen reminds that trust in national cooperation networks and innovativeness is prevailing elsewhere in Europe, as well, not only in Finland.

A critical question was courageously raised up by the audience on whether there are possibilities to survive for the Finnish marine industry in case all the manufacturing activities would be transferred elsewhere, and only the expert design and planning phase would be conducted from Finland. No particular positive expectations were laid on regarding preserving national jobs and know-how in this case. In general, professor Häkkinen reminded that SMEs are playing a larger role in the Finnish labor markets in the present circumstances where the ownerships of large companies are more and more running into foreign hands.

Through various company cases representing Finnish SMEs that were heard during the day, an observation was made that employees in SMEs seem to be more motivated and innovative than in larger companies. Also, the operative management in SMEs is clearly more present and available in the everyday working environment than a director in a large company. The background combining the various company cases was clearly an enterpriser having a clear and determined vision that has been put forward with persistency - often through trial and error - encouraging the personnel throughout the years to absorb the initiative atmosphere to work hard with motivation for the common goal. It became evident through the cases that spreading the thought throughout the company that survival is dependent on each of the workers' contribution will lead into positive results. Therefore, it is always worth putting effort on feeding positive atmosphere and team play. In addition to positive, initiative atmosphere, the success factors seem to culminate into knowing the company's expertise, specialization, customer orientation and marketing know-how - starting from the management level and reaching through whole of the personnel.

Successful examples were heard on cooperation between companies and research institutes, and the topic raised lively discussion and ideas on developing fruitful ground for deeper cooperation as one of the success factors for Finnish companies' foreign expansion. Positive development during the recent years was generally seen in the ways of communication and finding common goals between the companies and research institutes. Still, there seems to be a gap in the processes and rhythm of activities between the world of work and research institutes, since the research organisation approach cannot always catch up with the hectic cycles of business environment. However, positive trends and good intensions for getting more out of business and research cooperation was clearly in the air. This provides a fruitful ground for further SmartComp activities to smoothen the way for the industry - not only in Finland but also to reach the cooperation into deeper seas within the Central Baltic region.

Sari Nyroos

Training Manager

Centre for Maritime Studies
University of Turku

Finland



Does the Central Baltic region maritime cluster need a brand?

By Esta Kaal and Kaja Tampere

Cluster is a specific type of network – a geographical agglomeration of companies that are vertically and horizontally linked by channels for business transactions, cooperation and/or competition. These companies share a localized support infrastructure, labour markets and services, and face common market opportunities and threats¹. Clusters may comprise regional and/or field - specific cooperation networks which are in different stages of their life cycle: the so-called embryonic, established, mature or declining, or they may be purely theoretical constructs. Cluster networking may be based either on enthusiasm (so to speak) or on a well-defined strategy. Thus, in reality the aims and development stages of clusters may vary considerably.

The Central Baltic region maritime cluster

The Central Baltic region (Latvia, Estonia, Finland and Sweden) is a large region and a tightly connected economic area. Its geographical and environmental centre is the Baltic Sea which is an important area but also endangered by heavy sea traffic as well as other economic and human activities. Various maritime business actors (ports and port operations, shipbuilding and offshore industry, shipping companies, suppliers and logistics) contribute considerably to the GDP of the countries. The actors' economic activities, supply and value chains are intertwined both on the local and supranational level. Connected to them are various non-profit actors, like the government, local and city authorities, academic institutions, research and interest groups, associations and other sub-clusters.

Within the SmartComp project², analyses on the cooperation within the Central Baltic region maritime sector and on global competition have been carried out. These analyses show clearly that due to the changes in the conditions of the external environment, the maritime industry of the region faces common challenges:

- Increasingly fierce competition, well-developed power positions and the changes of business models in the global maritime industry.
- Lack of qualified workforce.
- Tightening environmental regulations which necessitate the introduction of qualitatively new – ships (green/blue ships) and fuels.

Thus, the CBR maritime sector exhibits all characteristics of a cluster, and to meet the challenges, fast measures and the utilization of the common potential of the region, primarily in the R&D sector, are required. The clusters in the region must rapidly develop the technical and infrastructural solutions to meet the new regulations and to make the whole region a “green forerunner” in the global competition.

The analysis of current cooperation networks revealed that at the moment the maritime expertise in the CBR relies on a group of individual companies. To make the regional maritime sector prosper, more efficient cross-border cooperation networks inside the cluster are needed. The benefits of horizontal cooperation are always linked to the increase of sales and profit, for instance through joint R&D, sharing labour and other resources, and even by getting access to new customers through the partner company. However, the preconditions for any cooperation always include soft, so-called intangible values such as trust, openness, the feeling of togetherness, and identity. Interviews with the main stakeholders of the CBR maritime cluster confirmed that the success of a relationship is highly tied to trust, which develops through open discussion, involving also challenging issues which are not always agreed upon. Win-win-opportunities are real, but their realization requires courage and trust. Also, it was pointed out in the interviews that in the end it is a question of corporate culture and communication.³

How do the current communication messages of the maritime sector of the countries in the region reflect the keywords relevant for the CBR cooperation such as high-tech, environmental friendliness, sustainability, effectiveness (low energy usage)? Based on the monitoring of homepages of the CBR cluster actors, we can conclude that the communication practices in this channel are rather different. Not all companies registered in the maritime-related areas have the address of their homepage at the moment; for example, in Latvia only a minor part of maritime-related companies had a homepage. Also, the values offered by the organisations to their customers and partners are primarily described through the quality indicators of the product/service (quality, professionalism, speed, etc.), not through the keywords of the CBR's aims in Latvia. The promises of environmental friendliness, smart (high-tech) and effective management were quite similarly represented on the web pages of actors of the Estonian and Finland maritime clusters. Still, there is a stronger promise of “sustainability” in Finland that was not mentioned in the monitored web pages in Estonia. Also, “safety” was well represented.⁴

Is there a need for a cluster brand strategy?

Thus, the CBR has all the characteristics of a cluster, and taking into consideration the size of the region, the complexity of relationships, differences in organisational cultures and communication practices, and the common challenges for the region will certainly not be solved with a sufficient speed through the development of cooperation in its so-called natural manner. The larger the region and the larger the amount of different actors a cluster comprises, the bigger the role of strategic management in achieving

¹ Padmore and Gibson 1998; Chiaroni and Chiesa 2006; Ketels 2012

² SmartComp – Smart Competitiveness for the Central Baltic region is a Central Baltic INTERREG IV A Programme 2007–2013 financed project which aims to support smart, environmentally sustainable development, growth, competition and cooperation between maritime clusters, cities and universities in the Central Baltic region, i.e. in Estonia, Finland, Latvia and Sweden. <http://www.cb-smartcomp.eu>

³ Maritime companies and their business networks in the Central Baltic region. SmartComp Research report 2, June 2013, p28 <http://www.cb-smartcomp.eu/index.php/cbsc:materials>

⁴ Kaal, E., Niin, T., Sihlman, P., Sukhno, M. (2013) CBR maritime cluster companies mission, vision and values statements: based on monitoring of CBR maritime cluster companies web pages. (in total 249 randomly selected webpages of maritime cluster members).

the goals. The stated vision of the goals and perspectives of the cluster and the implementation of this vision requires a common understanding of who we are how we want to be seen by others (reputation) and which human values underlie the relationships of the members of the cluster with their internal and external stakeholders. It is the identity and reputation that are part of the brand and branding which in turn is strongly related to all marketing goals of the cluster.

According to the recently published global study of cluster initiatives, from a list of ten objectives, two objectives related to generally promoting collaboration in the cluster, namely Identity and brand and Strategy and vision, have the highest priority ratings, followed by Innovation and R&D and Business environment improvement. Joint purchasing is the objective with the lowest priority ratings.⁵

The cluster branding is a tool for cluster reputation management that might provide different kinds benefits for cluster members, like recognition, a direction for cluster development. It also helps create civic pride, attract talents, investments and new cluster members, support export and sales promotion, express the company's corporate social responsibility (CSR). There is clear evidence that not only SMEs can benefit from cluster reputation, but also regional subsidiaries of global corporations (R&D and product units) may strengthen their position in the internal competition for resources among MNCs. Shortly, branding and marketing goals of a cluster involve creating visibility, attractiveness, differentiation and identification. Based on the analysis of the cases of the most successful clusters there have been pointed out five principles of cluster marketing and branding: 1) cluster brand as a relationship, 2) it needs a reason (common aims and challenges), 3) marketing is communication and development where cluster brand acts as a promise, 4) cluster marketing is a people's business, and 5) the fact that „differentiation“ of cluster brand relies very much on „culture of sameness“. Clusters are complex systems with multiple stakeholders. A solid, clear cluster brand image reduces the complexity and can make the cluster more comprehensible to the outside world, and also create the context and direction for stakeholders within the cluster.⁶

Branding of regional clusters is a time-consuming and complex process. The branding and identity building of the Baltic Sea region have been on a high-level political agenda for over a decade. Actions that would generate more 'we-feeling' in the region are very much needed. The image of the region and the way it is perceived by outsiders may affect the way it is seen by the locals and vice versa.⁷

A cluster is always part of a larger system

The developments in the whole Baltic Sea region influence the maritime clusters in the Central Baltic region, which

thus can never be considered in isolation. It is clear that just like cleantech R&D which the CBR maritime cluster need requires cooperation with other clusters, projects in innovation and environmental protection (such as HELCOLM, InnoShip, etc.), the CBR maritime cluster branding and marketing need cooperation with the ONE BSR initiative, which aims at branding the Baltic Sea region.

Summarising: the CBR maritime cluster is currently in the embryonic phase of development, at the early stage of growth. It is clear that a cluster cannot be created and managed by someone from the outside. This is the outcome of the interest of the actors in the cluster, the outcome of their agreements and activities. Triple helix (business, public and academic) cooperation can be very fruitful, but a **clear and shared future vision** as well as joint commitment is required for this cooperation to be productive. SmartComp project's final documents formulate the potential strategic goals of the cluster and the possible values of the common identity. The first strategy documents serve as the basis for further discussions on various future networking events inside the cluster. Only active networking and participation of cluster actors can increase the visibility of the local expertise, provide support for match-making forums for businesses and leverage the advantages of the cluster.

Esta Kaal

SmartComp project partner

Kaja Tampere

*Professor of communication management
SmartComp project consultant*

Tallinn University

Institute of Communication

Estonia

⁵ Sölvell, Ö., Lindqvist, G., Ketels, C. (2013) The Cluster Initiative Greenbook. Second edition. <http://www.clusterobservatory.eu/system/modules/com.gridnine.opencms.modules.eco/providers/getpdf.jsp?uid=c57a2f9f-aa59-4af8-a8f9-4fa99e95b355> retrieved 24.10.2013

⁶ Andersson, M., Solitander, A., Ekman, P. (2012) Cluster branding and marketing – a Handbook on Cluster Brand Management. http://www.tendensor.com/wp/wp-content/uploads/2013/01/TENDESOR_CMB_HANDBOOK-090113-sheets.pdf

⁷ An Action Plan concerning the European Union Strategy for the Baltic Sea Region 2013 p. 165-167 http://files.groupspaces.com/EUSBSR/files/676806/KugXDoo1Q_LQr51KI7tL/Action+Plan+2013.doc

Surging U.S. energy production revives maritime sector

By Tony Munoz

The sweeping economic transformation of the United States is being driven by surging production of shale oil and gas. The U.S. is expected to become energy independent by 2030, if not sooner, and, according to the Energy Information Administration and other experts, has already overtaken Saudi Arabia as the world's largest supplier of hydrocarbons.

The new output is coming largely from the Bakken Formation in North Dakota and the Eagle Ford Formation in Texas. But there are also large shale deposits in Ohio, Pennsylvania, New York and California that are fueling the U.S. economic boom and the renaissance of U.S. maritime. And let's not forget the Gulf of Mexico, where new deepwater plays are boosting production and the demand for offshore workboats and tankers.

As a result, the U.S. over the past five years has reduced imports of crude oil and natural gas by 15 and 30 percent, respectively. The ability to produce more energy domestically has not only narrowed the U.S. trade gap but transformed the politics of oil.

It used to be that OPEC and, to a lesser extent, countries like Russia held all the cards. Following its formation in 1960, OPEC gave notice in 1973 of its ability to politicize crude, which resulted in recessions and unprecedented price swings in Western countries. OPEC member Venezuela's former president, Hugo Chavez, relished in mocking the U.S. with his disdain for American presidents and their policies.

But even before his death last March, Venezuela's crude production was falling; and the nation, which depends on oil for 95 percent of its exports and 45 percent of its annual budget, watched its crude exports drop by half. As the geopolitical wheel turns, Venezuela now relies on the U.S. more than the U.S. does on Venezuela.

Bottom line, the U.S. energy boom has reduced OPEC to a shadow of its former self and provided other benefits as well.

Record investment

With the U.S. a hotbed of energy production, investments in domestic production are skyrocketing, and not just from U.S. companies. In January Sinochem bought a 40-percent stake in the Wolfcamp Shale in West Texas for \$1.7 billion. Japanese conglomerates Mitsui and Mitsubishi and GDF of France each bought 16.6 percent of Sempra Energy's planned LNG facility at Hackberry, Louisiana for an estimated \$7 billion. And Mitsubishi invested about \$6 billion in an Encana Corp. shale project.

Even OPEC has jumped on the bandwagon and – along with Statoil – made big investments in U.S. shale and LNG. The Energy Information Administration recently reported that more than twenty percent of the \$134 billion in U.S. gas investment between 2008 and 2012 came from joint ventures with foreign companies, who see the potential in U.S. exports of LNG.

The Department of Energy has approved 16 applications for LNG export licenses to countries with Free Trade Agreements. In September, it approved its fourth conditional license for LNG exports to non-FTA countries – this one for Dominion Resources' proposed Cove Point Terminal in Maryland.

Future exports of U.S. LNG are attractive due to the huge disparity in natural gas prices in global markets – from \$1 per mcf in Russia and \$3.50 in the U.S. to \$8-\$10 in Europe and \$16 in Asia. With the U.S. entering the gas export market in 2015 or so, prices are expected to stabilize at around \$8 per mcf within a couple of years and remain there for the foreseeable future.

Reviving the maritime sector

No one was more surprised by the sudden boom in energy production than the U.S. maritime industry, which had been struggling under decades of decline and neglect. There was a glimmer of hope in 2010, when President Obama announced a bold new initiative to boost energy exploration in the Gulf of Mexico, but a few weeks later the *Deepwater Horizon* rig exploded and so did the prospects for shipyard orders and new jobs.

The fact is the U.S. has not had a maritime policy since before the Reagan Administration despite the fact that the Jones Act -- the U.S. cabotage law which was passed by Congress as the Merchant Marine Act of 1920 – contributes about \$36 billion each year to the economy.

The federal shipbuilding program known as Title XI is a loan guarantee program legislated in the Merchant Marine Act of 1936 and designed to promote vessel construction in U.S. shipyards. The current program was restructured by the Nixon Administration as part of the Federal Ship Financing Act of 1972. But it has suffered from a lack of funding over the years.

While Title XI was revived by President Clinton with new guarantees of nearly \$1 billion, it struggled under the Bush Administration and has failed to receive additional appropriations from the Office of Management and Budget, which consistently eliminates what it considers corporate subsidies. Meantime, the wars in Iraq and Afghanistan were overwhelming federal budgets, and the funding dried up.

As a result, since the late 1990s U.S. shipowners have had to self-fund projects based on customer demand. Consequently, shipyards – particularly those medium and small yards that make up the majority and do not benefit from military contracts – have received only sporadic orders.

So the last twenty-four months have been filled with hope and excitement about new jobs and tonnage for U.S. maritime. One of the main beneficiaries to date has been Crowley Maritime Corporation, which earlier this year completed a 10-year program of building 17 new articulated tug-barges, adding more than three million barrels of capacity to its fleet just in time for the boom in shale oil production. Crowley has since ordered eight new product tankers from Aker Philadelphia, the first four of which will be delivered between 2015 and 2016.

After several lean years, Aker Philadelphia had been struggling to stay in business due to the dismal state of shipbuilding in the U.S. In 2011 it received \$42 million from Pennsylvania taxpayers and, along with private financing, built two 330,000-barrel tankers solely on speculation. In 2012 Crowley stepped in to buy the two tankers, the *M/V Pennsylvania* and *M/V Florida*, to replace the *Coast Range* and *Blue Ridge*, single-hull tankers which were being phased out due to OPA 90.

General Dynamics NASSCO in San Diego had also been shedding jobs and in 2012 reached its lowest level of employment in more than 25 years. The U.S. drawdown in the Middle East put a big question mark in NASSCO's future as well because of the yard's heavy dependence on the U.S. Navy for business.

So it came as a huge and welcome surprise when, last December, TOTE, Inc. announced it had contracted NASSCO to build two 3,100-TEU, LNG-powered container ships, the first of their kind in the world. Even more amazing, there had not been a container ship constructed for the Jones Act trade since the 1970s.

This past May NASSCO got another pleasant surprise – a contract to build four product tankers for an affiliate of American Petroleum Tankers, a company majority-owned by the private equity firm Blackstone. The contract will add more than 800 jobs to NASSCO and more than 165 seagoing union jobs. The yard had previously built five product tankers for APT. And just last month Seabulk Tankers announced it would build two new Jones Act product tankers at NASSCO.

Boom times in the Gulf

The energy boom has also launched a new wave of shipbuilding for Jones Act operators in the U.S. Gulf of Mexico, where freight rates for Jones Act tankers have topped \$100,000 per day and the demand for offshore

workboats has never been greater. Privately held Edison Chouest, the biggest operator in the Gulf, announced in July that it would build 40 new offshore support vessels to meet growing demand in the Gulf and U.S. Arctic.

Harvey Gulf, another operator of offshore workboats aimed at the burgeoning deepwater market, announced an additional investment of \$540 million in new offshore vessels, raising its total capital spending to \$1.7 billion. The newbuildings will include the first LNG-powered workboats in the world. And Hornbeck Offshore is building 24 new deepwater vessels at a cost of more than \$1 billion.

As the U.S. once again becomes the world's biggest energy producer, the maritime sector will continue to benefit. The boom is stimulating investment both onshore and off, and U.S. maritime is embracing its newfound opportunities with open arms.

Tony Munoz

Publisher & Editor-in-Chief

The Maritime Executive

The USA



Finnish marine SMEs in Brazil

By Arto Kuuluvainen

At the moment, there are about 60 Finnish firms operating in Brazil. According statistics provided by Finnish customs, Finnish companies employed almost 20 000 employees in Brazil in 2011. However, the number of Finnish SMEs operating in the country is clearly smaller than this 60 while many of these firms are large corporations (for example Wärtsilä, Metsä-Serla, Nokia Siemens Networks etc.). Again, when Brazilian markets are observed from the viewpoint of Finnish marine SMEs, it is noted that less than five companies have a postal address in Brazil. However, Brazilian marine sector is growing extremely fast and this opens great business opportunities also for Finnish SMEs. Hence, as a part of FIMECC's Innovations and Networks programme's project 'Direct International Marine Networks and Business Models', researchers of Turku School of Economics have studied internationalization processes of Finnish marine SMEs already operating in Brazil. As a result, several challenges related to Brazilian operations were identified. Most typical of these are briefly introduced in this paper.

First of all, it should be highlighted that Brazilian know-how in marine sector is still rather weak. Therefore, for example local shipyards need help from international partners. Otherwise, answering to the requirements of country's huge investment programs would be impossible.

For example, in 2013, there were 28 new drilling ships to be built in Brazilian shipyards for the needs of partly state-owned oil giant Petrobras. Time period for the delivery of these ships is 2015-2020. These investments are related to the huge oil discoveries conducted by Petrobras during the last decade. In October 2006, the company managed to discover a very large oil field. The field is currently known as "Lula". The Lula field lies below 2,000 metres of water and then 5,000 metres of salt, sand and rocks. The field was discovered in a geological formation known as the Pre-salt layer. Challenging circumstances just underline Brazil's need for highly developed off-shore technologies. This is something that Finnish marine companies should be able to sell to Brazilian companies. Moreover, new oil discoveries will be most probably made also in the near future and Petrobras has announced that it aims to duplicate Brazilian oil production until 2020. It has been evaluated that investments required for reaching this target will be worth of about 240 billion dollars during the next four years.

However, like already mentioned, this far Finnish SMEs have been very careful concerning Brazilian markets. There are many reasons for this carefulness. Of course, Brazil is geographically very far from Finland and, on the other hand, only very few Finnish companies possess experience about collaboration with Brazilians. Some of the most typical challenges are introduced next:

- Brazilian regulations and taxation
- Cultural differences (also between different parts of Brazil)
- Language barriers
- Lack and price of qualified personnel
- Weak infrastructure
- Shipyard structures
- Competition

From the Finnish viewpoint Brazilian taxation and regulations (for example local content -regulations) are often found really complex, constantly changing and hard to understand. Therefore, Finnish SMEs usually need Brazilian partners (such as law firms) to help them with the establishment process.

There are also some cultural differences between Finnish and Brazilian. However it could be stated that these cultural factors only rarely cause major problems between Finnish and Brazilian managers. In general, it could be stated that Finns have more straightforward mind-set and therefore they may sometimes be surprised about slower Brazilian decision-making styles. It is also stated that making business with Brazilians requires more time than similar deals would take when done between companies coming from Nordic countries.

Language barriers refer to the fact that English is not very widely spoken in Brazil. It has been evaluated that only about 5 % of Brazilians can speak English fluently. Therefore, it is essential that Finnish companies have managers who can speak Portuguese. This is important also from the viewpoint of getting access to local networks. The role of personal relationships is very important in Brazilian business environment.

Also local infrastructure can be an unpleasant surprise for Finns. Although Brazil is investing in new harbours and railways, the road infrastructure is still very poor.

Furthermore, especially marine sector faces lack of competent workforce. Brazilian marine industries were really weak before recent oil discoveries. Therefore, also the education and training investments in marine sector were really minor. Hence there are only a very limited number of marine engineers in the country. As a consequence of current high demand for marine engineers, these engineers have quite high salary level. In other words, cost of workforce can be surprisingly high in Brazil.

Also the structures of Brazilian shipyards differ from Finnish shipyards. Whereas Finnish shipyards operate mainly through their networks and utilize lots of suppliers, Brazilian shipyards are still producing many tasks by themselves. In other words, Brazilian shipyards are in a sense more labour-intensive whereas Finnish shipyards can be seen to be more like systems integrators.

Finally, the Asian companies are already operating in Brazilian markets and therefore the competition is getting tougher. Some Brazilian shipyards are already partially owned by Asian companies. As a consequence, these shipyards usually prefer Asian suppliers and solutions that are already familiar to them.

Despite of many challenges, Brazil still offers huge opportunities for a profitable business. This was recently proved by Finnish Almaco Group Oy by winning the newbuilding contract for the complete Living Quarters on six drillships to be used in the Brazilian pre-salt ultra-deep layers drilling program. The deal is worth over 100 million dollars.

Arto Kuuluvainen

PhD, Research Manager

Centre for Collaborative Research
Turku School of Economics
University of Turku

Finland



Seafarer demand forecast based on economic conditions

By Makiko Kubo and Takuma Matsuda

It is important to study and understand the volume of the demand for seafarers at present and in future, in planning and ensuring human resource development of seafarers. Japan Maritime Center (JMC) has recently conducted a study, "seafarer demand forecast based on economic conditions" to challenge the issues left by the preceding researches.

Regarding forecast of seafarers' demand and supply, the most well-known research is the one by the Baltic and International Maritime Council (BIMCO), which is an international organization, standardizing a form of charter contracts, and the International Shipping Federation (ISF) (hereafter called "BIMCO/ISF"). Others include the one by Drewry Shipping Consultant which is often referred to as to complement BIMCO/ISF, and "A research on world seafarers' demand and supply forecast and effective measures to ensure sufficient seafarers" by the Japan International Transport Institute (2010).

BIMCO/ISF, conducted by Professor Rob Wilson of Warwick University, has been undertaken every 5 years since 1990, and its latest publication is "MANPOWER 2010 UPDATE" (hereafter called "BIMCO/ISF 2010"). It conducted a questionnaire survey to the governments and the shipowners' associations in the major seafarer supplying countries to estimate seafarer supply in 2010. It also collected other information such as job turnover rate from the appropriate organizations to develop 2015 and 2020 forecast of supply. As for demand of seafarers, it figured out a size of each country's merchant fleet based on Lloyd's Register-Fairplay (currently IHS-Fairplay), then deemed the number of seafarers necessary to operate them the estimated demand for seafarers. For 2015 and 2020 demand forecast, it assumed expansion rate of world merchant fleet in the future at 2.3% per year (on base case), by taking into account of actual numbers of vessels of the past years, a number of shipbuilding orders and so on. BIMCO/ISF 2010 showed that a seafarer shortage in 2015 will be 69 thousand and it will diminish to 38 thousand in 2020 (on base case).

BIMCO/ISF relied mainly on the result of questionnaire and actual figures of the past years and did not take economic conditions explicitly into consideration. However, it is well known that the volume of fleet on the trans-ocean shipping and the merchant fleet size to carry cargo are highly responsive to the world economic conditions, and so is the demand for seafarers accordingly. It should be, therefore, important to include the impact of economic conditions explicitly in the projection of seafarer demand.

In order to challenge this issue, JMC constructed a forecast model for demand of seafarers, taking into account of the major economic indicators. To start with, this study estimated collective volume of freight movement of bulker and tanker respectively in between the 9 zones of the world. Gravity model, which is often employed in the analysis of international trade, was adopted, assuming that the volume of freight movement was correlated positively with "GDP of the both zones of export and import" as well as the "population of the zone of import", and negatively with "distance" of voyage. An exception to this assumption was the container ship case, in which "population of the zone of import" was not used as an independent variable, because it reduced explanatory power of the model. The next stage was to estimate the world shipping tonnage in the future, assuming that it was proportional to the amount of freight movement. Then, the number of vessels in the future was estimated by dividing the world shipping

tonnage by an average ship tonnage of the vessel. As an average ship tonnage should reflect the recent trend of the vessels getting larger, the average increase rate of the ship tonnage each year was calculated and it was assumed that the average ship tonnage was to increase in accordance with this rate. Finally, the demand for seafarers in the future was reached by multiplying the number of vessels so estimated by the number of seafarers per vessel.

As data for freight movement, GDP and population, and the average shipping tonnage, such data compiled by IHS Global Insight, World Economic Outlook Database and IHS Fairplay World Fleet Statistics were deployed respectively. For distance, those between the largest ports in each zone were adopted. For the number of seafarers per vessel, the result of the study by the Japan International Transport Institute (2010), which estimated the number of seafarers for container ship, bulker and tanker in the case of a vessel more than 8000GT as 23, 21 and 26 respectively through the questionnaire survey, was referred.

This study concluded that the seafarer demand was estimated to be 1,352 thousand in 2011, 1,459 thousand in 2015, and 1,569 thousand in 2020. The gaps between demand and supply could be calculated by using the supply forecast in BIMCO/ISF 2010, and it was found that there was a shortage of 4.6 thousand seafarers in 2015 and 140 thousand in 2020 on that basis.

The gaps between demand and supply estimated by the JMC study are much smaller than those in BIMCO/ISF 2010 as a whole, although the gap in 2020 was larger than that in 2015, contrary to BIMCO/ISF 2010. The difference between the two researches can be explained by the fact that JMC study reflected the world recession after the failure of Lehman Brothers and the future economic growth in emerging countries, whereas BIMCO/ISF 2010 (and other studies) mainly reflected changes in the size of world merchant fleet in the past.

JMC's study shows the importance to analyze a mechanism of how the size of merchant fleet and the number of seafarers rise/fall according to the economic conditions, and to reflect it in a forecast in the trans-ocean shipping. We hope that this study will be of any help towards the improvement in the methods of forecasting seafarer demand and supply as well as in the planning of seafarers' human resource development.

Makiko Kubo

Researcher

Takuma Matsuda

Researcher

Japan Maritime Center

Japan

Korean marine industry and opportunities for Baltic region

By Ari Virtanen

In the past decades shipbuilding has moved from Europe to North East Asia. China, South Korea and Japan combined account for more than 90% of the world's ship and offshore deliveries. China is the biggest producer measured by gross tons but South Korea is the biggest measured by the value. In South Korea there are few big companies dominating the marine industry; Hyundai HHI, Samsung SHI, Daewoo DSME and STX. These four companies are the biggest in the world and produce altogether more than 400 vessels annually from which almost half are made by Hyundai group shipyards.

Samsung SHI is the most specialized of these shipyards. They make offshore vessels like Drillships for oil exploration, oil rigs, LNG carriers and floating production units. Newest and greatest vessel type is floating LNG-FPSO unit, which is developed together with Technip for the Royal Dutch Shell. This Prelude type vessel will be 468 m long massive LNG production unit for Australian waters. Samsung shipyard is located at Geoje island near Busan. Another Geoje based shipyard belongs to DSME. They are specialized in offshore but are also a major producer of naval ships and ferry ships.

Hyundai Heavy Industries owns the world biggest shipyard in Ulsan. Annually more than 90 vessels are built there. Huge shipyard keeps roughly 50 000 people busy at work. Out of those 50 000 workers 28 000 are under Hyundai payroll and others working for suppliers and ship owners. Company is sourcing parts and technology from all over the world. HHI procurement division sources more than 1 million different items. Especially in demanding offshore area large shipyard companies use more and more so called integrators. Some famous integrator companies are ABB, Kongsberg, and National Oil Well which are also well known in the Baltic region.

The ship owner will say their word what supplies and suppliers are used. They make a so called preferential list containing major important parts used in ship. Ship owners also send their representatives to follow the construction project. Besides ship owners also integrators are decision makers to say what parts are chosen. Integrators are especially important in demanding offshore projects. Finally shipyard is always negotiating with suppliers and integrators to find the lowest cost but still keeping the quality in mind.

Ship or offshore vessel owners are often located in northern Europe. Norway and UK are some of the big countries. North European Companies like Maersk, Stena and Wilhelmsen are well known all over the world. Also integrators are strongly based in Baltic region. Companies like ABB, Rolls Royce, Wartsila and Kongsberg are among the biggest integrators in the marine industry. Suppliers for regular cargo ships are mostly doing production in Asia close to their clients. On the other hand many offshore suppliers are successfully doing their production in the Baltic region.

Understanding the marine industry value chain is crucial for the offshore supplier located in the Baltic area even

though most of the vessels are built in South Korea. Marketing and communication should be targeted to all decision makers. Biggest wins are made if supplier companies are involved in early stages even with design studios and teams. Local representatives communicating directly with shipyards is often needed. Friendship with the decision makers is the best way to do business.

Shipyards choose suppliers not only based on price level but also the quality and prompt deliveries. In Asia and especially in South Korea the human face to face communication is extremely important. If the representatives of the supplier is on the other side of the globe in different time zone, everyday business is not really working. Language and cultural differences are big. Friends prefer to buy from friends. Local presence and 24/7 service attitude is needed to be successful.

Business model where the most expensive parts or top of the line products come from Europe but in the mean time lower cost and large volume products are made locally is working often well. Shipyards in Korea are all the time looking for this kind of collaboration. Investment for the production can come from the Korea side. Establishing this kind of production is also supported by the Korea government. Korean government also has established a free economic zone BJFEZ specialized in marine industry. Different kind of in kind support and tax breaks are possible for the Joint venture if the majority is owned by the foreign company.

Company doesn't have to do all the business alone. Good and low risk way is to find a local agent in Korea. Agent can be the communication channel between the company and clients in Korea. Finpro is one of the best organizations to help in finding an optimal agent or a distributor in marine industry. Having established relations to the biggest shipyards in the world speeds up the finding the best local partner. The objective and neutral role of Finpro as a partner in Team Finland is appreciated also by the companies in South Korea.

There is number of products sold to Korean shipyards by northern European companies. On the other hand many companies are still very much focused doing business only in the near by Baltic region. Huge opportunities exist in Korean market especially when both shipyard and supplier can find win-win situation. In high technology applications these win-win opportunities are more likely.

Ari Virtanen

Head of Finland Trade Center

Finpro

South Korea



Common value chains in East Asia – case shipbuilding

By Jari Makkonen and Sari Arho Havrén

Preface

Team Finland Foresight has addressed in 2013 the topic of “Common Value Chains in Shipbuilding”, with particular focus on China and South-Korea.

Reason and need for considering East-Asia and emerging markets in general as focus business areas lie in the forecast of development of the world GDP in the future. Western Europe will be 7% of the world economy in 2050 (Tekes –report “Sino-Finnish Paths to International Competitive Advantage” by Booz & Co.) and hence adaptation and work on keeping Finland and Europe in general competitive in the long-run needs our attention already today. Furthermore, we must point out that when talking about building of new ships, South-Korea, China and Japan maintain market share of over 90% globally. Hence, succeeding in Asia is one of the key factors to existence of maritime cluster in Finland.

At the same time Europe has, however, maintained market share in some special type of vessels, such as cruisers. Also, the European suppliers of maritime components have been able to find new opportunities in offshore oil and gas industries, whilst construction of merchant ships and container ships, for example, has been transferred to Asia. The Asian competition is getting tougher and the Europeans will find it harder to maintain their position in the special products.

New regulatory and market driven trends will offer new opportunities for the Europeans as well. Scenario documents offer some guidance on possible futures and innovation around the identified trends might be crucial for future success and position in the value chain.

Document “Green growth opportunities in the EU Shipbuilding sector”¹ is exploring these new opportunities, which include: fuel efficiency, higher Corporate Social responsibility (CSR), nitrous oxides (NOx) abatement, sulphur oxides (Sox) abatement, greenhouse gases (particularly CO₂) abatement, ballast water and sediment treatment, offshore renewable energy and development of Arctic resources exploitation. Market potential is debated to be minimum of 12.5-15.5 billion Euro per year.

Crisis of global shipbuilding and effect on East Asia

Korean companies have converted more aggressively towards offshore –industry than Chinese shipbuilders, who instead seem to seek more opportunities in cleantech –related business or in metal-working business in general. Relatively low technology content of Chinese shipbuilders is also affecting their ability to compete even on bulk carriers and merchant ships since the end users’ requirements for energy efficiency and other technology content constantly grow.

Chinese shipbuilders face great difficulties: out of 1600 Chinese shipyards only 200 have currently any orders. Several of them will focus on ship repair instead of new ships. Many of them will also close during 2013-2015. The latest target of the Chinese government is to scale down the number of shipbuilders into 10 strong ones.

At the same time the component market seems to move towards low-mid and low-low segments. This might result into loss of market share by some foreign companies. The

foreign companies need to work on end customer demand assessment and product adaption and eventually move towards mid and mid-low segments.

This will require major paradigm shift in Finland, as well as increased sense of urgency. At the same time, however, more suitable mid-segment products might have to be developed for gas and oil offshore business, since this sector definitely requires much more on the quality, longer life-cycle, approvals and technical documentation of components and similar.

Market share of Chinese ship owners increasing

China has done major leaps in the field of international finance (foremost through China Development Bank and China Exim Bank) and is not remaining short of measures at home either. This will result to higher market share of Chinese owners and operators of ships and other maritime structures.²

Currently most Finnish suppliers work with shipyards focused on foreign ship owners. Instead, one should learn how to focus on Chinese ship owners (mainland China, Hong Kong) and satisfy their needs, unless Finnish and other foreign players accept being further marginalized in this industry.

Regional differences of industry structure between China, Japan and South-Korea

Intraregional trade of components in East Asia is relatively high.

East Asia has done fairly well in sharing production and components intra-regional trade being 50 % compared to Europe’s 63 %.³

The role of China has been assembly, the role of Korea and especially Japan, supply of high-tech components and content. Japanese and Korean industrial policies have been “*export out/protect in*”⁴ The idea has been to let national champions (capable of design and engineering) grow thanks to protectionist measures against foreign suppliers, both de facto and through a very developed sense of favoring national suppliers (and their own, national ecosystem of component suppliers and similar). P.R. China has opted for an accelerated model of developing its economy and even if it is claimed to be protectionist in several sectors, however, it can be considered relative open if compared with Japanese “keiretsu” or Korean “chaebol” –based systems. We can as a matter of fact suppose that China could be more open to buy value added services in ship design and engineering than e.g. South Korea.

Considering the a.m. differences of business environment, Finnish companies should consider the implications to their business model, partnerships and end-customer relationships. Each East Asian country needs an individual approach and a local presence as well.

² United Nations: Review of Maritime Transport 2011 & 2012, Sources 16&17

³ Trade Patterns and Global Value Chains in East Asia: From Trade in Goods to Trade in Tasks, Source 40) and the Economist magazine (a Continental Divide, May 18th 2013, Source 35),

⁴ (World Economic Forum, The Shifting Geography of Global Value Chains: Implications for Developing Countries and Trade Policy, Source 26).

¹ Ecorys 2012, Source 6

Implications for manufacturing operations in Finland

Strong global signals indicate, supported by studies of global value creation, that some industries are repatriating their production, especially from China because of higher international forwarding cost, higher local salaries and strong RMB. However, this is particularly possible for countries having a big home market, which is not the case of Finland.

At the same time, maritime-related Finnish companies interviewed indicated that for them is important to have local manufacturing base in Asia for the pure reason of being near to the customers and not having to rely on far-away production taking minimum 5-6 weeks to ship the product to East Asia.

For Finland and our innovation system it will however be important to maintain part of industrial operations and especially R & D & I in Finland and near to Finland, since we can hardly maintain our competitive advantage by transferring all production operations to Asia. We need more encouraging policies for improved business climate, better people skills for increased efficiency in manufacturing and all types of test beds allowing companies to design components and systems so that positive differentiation and competitive edge against Asian and global competitors could be maintained.

Currently Finnish companies have good financing and technological support –related to tools e.g. from Tekes and VTT. These tools should now be used aggressively to improve the market penetration in shipbuilding and in oil and gas offshore industry.

Team Finland can assist the Finnish partner companies to search for local funds for R&D and other development work.

Challenges for the Finnish machinery producers in general

The topics raised in this report remain universal for any machine-building industry, being namely

1. **Sense of urgency:** emerging economies grow fast; the decision-making cannot be slow amongst the

Finnish companies acting on the global markets growing fast.

2. **Need of understanding business of end customers** and improve **market segmentation** and design of solutions for local customer needs.
3. **Need of being present on the market and live in the rhythm of the end customer and distribution channels – become local.** Sometimes this can be reached through a good local network of distributors and other stakeholders, very often through own commercial operation and more and more frequently through own local manufacturing.
4. **Need of understanding the specifics of each country** and not oversimplify the modes of market entry or business development.

Jari Makkonen

Head of Trade Center

Finpro

China

Sari Arho Havrén

*PhD, Consul (Innovation)
Consulate General of Finland
Shanghai*

TEKES

China

Skyrocketing Chinese maritime cluster and its future development with international partners

By Minghui Gao

The development of the cluster

In the last two decades, with China's emerging as a global giant on exporting, a vital foundation has been provided to its maritime development, especially in terms of its shipbuilding industry, shipping industry and ports.

By 2010, China has been ranked as the largest shipbuilding country in terms of order book volumes since then. As the world's biggest ship manufacturer, 80% of the gross output of Chinese shipyards is devoted to export customers, mainly to Asia and Europe. With their mega-size production and technology capacity, two conglomerates – the China State Shipbuilding Corporation (CSSC) and the China Shipbuilding Industry Corporation (CSIC) – dominate China's shipbuilding market.

With China's ever-increasing trade and its flourishing shipbuilding business, China's total demand for maritime shipping is the largest among all countries. Two originally state-owned enterprises – China Ocean Shipping Company Group (COSCO) and China Shipping Company Group (CSC) – have become "the backbone" of China's logistics/shipping market. By the end of 2012, the dimension of China's shipping fleet ranks 3rd in the world.

As the country increasingly gains ascendance in global trade, China has been experiencing a boom also in harbor construction. Currently there are over 150 seaports in China, providing an overall port throughput tops the world list. Meanwhile, China's port handling efficiency also set world records.

International networks of the cluster

In the recent years, foreign investment has been engaged in support activities of shipbuilding industry, such as marine equipment industry. Most of the foreign capital comes from Europe, South Korea, the U.S., and Japan (e.g. Wärtsilä, MAN B&W, ABB, Caterpillar, Daeyang, Samsung Group, Daewoo). Foreign investment in most joint ventures has been limited to a 49% share, especially when it concerns shipyards, diesel engine and crankshaft manufacturing enterprises. They are also required to "transfer their expertise to local partners through the establishment of technology centers". Besides such joint ventures, the cooperation between China and foreign shipbuilding companies has also been increasing. For instance, the increasingly topical polar scientific research has brought the Helsinki-based Aker Arctic Technology Inc. (hereafter Aker Arctic) and China together. In 2012, Aker Arctic signed a contract with China, who chose Aker Arctic to design a new icebreaker that is equipped with advanced scientific equipment for the purpose of China's research on polar oceans.

Concerning shipping industry and ports, the main players COSCO and CSC have been actively developing their international networks by expansion overseas. Meanwhile, the international network of China's ports has been strengthened by the entry of foreign companies. More importantly, the EU-China Maritime Transport Agreement entering into force has further accelerated the international cooperation in the global shipping industry.

The future of the cluster

The development of China's maritime clusters receives powerful support from the Chinese government, maritime enterprises in China generally have adequate funding to carry out their operations, and profit from rather low labor costs comparing with many other countries. However, the industrial structure and layout should be optimized in order to have more rational planning in terms of shipbuilding and shipping capacity, to establish stronger connection between clusters and cooperation between industries, and to form a more open market for competition. Meanwhile, a more advanced strategy for human resources should be applied in order to attract more skilled personnel who have the updated know-how on technology and management. This would require cooperation between the clusters and with universities, other research institutes, and foreign partners.

Concerning shipbuilding clusters, they need to find a new direction for further development – for instance in building high-end cruise vessels and icebreakers. In this case, maritime companies in the Baltic Sea region would have more opportunities to provide such technologies to design vessels for China's maritime clusters, or provide supporting facilities for them. The previously mentioned Finnish Aker Arctic has set a very good example on this matter.

Concerning clusters for shipping and ports, as international tycoons like the Danish Maersk are extremely powerful in the international markets, other companies in the Baltic Sea Region might want to cooperate with the Chinese shipping lines in order to benefit from services which have advantages on both price and the shipping routes. Furthermore, the entry into force of EU-China Maritime Transport Agreement will definitely create more opportunities and reduce more barriers in the field of shipping. More open shipping lines and ports would benefit both the parties concerned.

To conclude, the cooperation between maritime clusters of China and the Baltic Sea region will require efforts from both sides, from the company level and the governmental level. The Chinese government has expressed its willingness to utilize foreign advanced knowledge, and has encouraged such activities by adopting policies accordingly, which might do a big favor in accelerating such cooperation.

Minghui Gao

Research Assistant

Pan-European Institute

Turku School of Economics

University of Turku

Finland

This article is based on the chapter of Chinese maritime clusters in the SmartComp Research Report No. 3.

The booming maritime sector in the Far East – what's in it for Finnish companies?

By Eini Laaksonen and Hanna Mäkinen

The maritime sector's general outlook

The global maritime sector is facing great changes. The shipbuilding industry worldwide is suffering from significant excess capacity, particularly due to the large improvements in the productivity of the shipyards and the over-investments in the industry. The production capacity, particularly in several Asian countries, was expanded forcefully before the economic crisis – for instance, in only a few years, China rose to the largest shipbuilding nation in the world. Europe, on the other hand, has lost its market share for the booming maritime industries in the Far Eastern countries, mainly China and South Korea, which are producing series of standardized vessels at low costs. However, as the competitive advantage of the European clusters lies in high quality and specialization, they have been able to maintain their market share particularly in some special types of vessels, such as cruise ships. The imbalance between supply and demand in shipbuilding has also affected shipping markets because so much new tonnage is entering the market. Although the demand for shipping services has been growing after the economic downturn, the fleet oversupply is still overrunning the cargo growth and the future demand for cargo ships remains uncertain.

Besides the changes in the shipbuilding industry worldwide, there are other trends shaping the development of the global maritime sector. The rise of emerging countries, such as China and India, is to have large effects on seaborne trade, driving supply and demand of goods and services, resources and technologies. Consequently, Asia is expected to take a central position in the global seaborne trade in the future. Concentration of trade flows to certain locations and increasing urbanization can lead to infrastructural bottlenecks, necessitating the development of more efficient logistical solutions. The growing energy demand, on the other hand, is leading to the shifting of energy production to new areas and to drilling of oil and gas into even greater depth, particularly in the Arctic region. Energy production in challenging conditions together with opening of new shipping routes, such as the Northeast Passage, create a growing demand for specialized maritime and offshore solutions, as well as new icebreaking and shipping services. Environmental-friendly solutions are of increasing importance as well, as there is both a growing need and awareness to prevent environmental pollution and to mitigate the climate change.

For Finland these developments create great challenges as well as opportunities. The Far Eastern clusters have rapidly emerged as true rivals, and the European clusters have not found ways to respond to this development. However, by investing in the core competences and by keeping these competitors close through active networking, the Finnish maritime companies could gain a new kind of role in the global maritime sector.

The presence and networks of Finnish maritime companies in the Far East

China has seen an unforeseen growth in its maritime sector during the past decade, and thus it is one of the key destinations of international maritime business. Even though most of the Chinese shipyards are state-owned and the openness of Chinese shipbuilders to foreign shipbuilding companies is limited, the situation is changing gradually and recently foreign investment has been engaged in support activities of shipbuilding industry, such as marine equipment. Most of the foreign capital comes from Europe, South Korea, the U.S., and Japan (e.g. Wärtsilä, MAN B&W, ABB,

Caterpillar, Daeyang, Samsung Group, Daewoo). Foreign investment in most joint ventures has been limited to a 49% share with a requirement to transfer expertise to the local partners. Besides such ventures, the cooperation between China and foreign shipbuilding companies takes place also in other forms – in 2012, Aker Arctic signed a contract with China on designing an advanced icebreaker.

Interesting regions for maritime sector are also Japan and South Korea, in which Finnish maritime companies are also relatively active. In Japan cooperation has taken place for instance in the development of RoRo ships, fuel cell products, and diesel engines. Moreover, for example NAPA has collaborated with Japanese ClassNK, the world's largest ship classification society, in creating solutions to increase eco-efficiency and reduce fuel consumption. Elomatic, in turn, has cooperated with Japanese MTI, NYK Line and Italian marine designer Garroni Progatti in developing an environmentally friendly low emission container ship. Several examples of Finnish activities can be found also in South Korea, such as Wärtsilä providing ship power related services.

While being a hub of maritime business and expertise, Singapore is also one of the key locations for Finnish maritime experts. In fact, of the ASEAN countries, Singapore is Finland's largest trading partner and over 70 Finnish companies are present in Singapore to serve the whole Asia Pacific. Over half of the Finnish exports to Singapore comprise machinery and equipment, and the most significant Finnish operators in Singapore include Neste Oil, Kone and Wärtsilä. The formation of these business relationships has been supported through international agreements concerning issues such as visa freedom and taxation and through minister-level trade promotion visits.

In addition to these global players, Indonesia, Malaysia, Philippines and Vietnam are growing steadily and can be considered as emerging players in the maritime sector in the Far East. For instance Konecranes recently won a record order of over EUR 100 million for container handling equipment from an Indonesian terminal operator. While Finnish companies have not yet found that much business opportunities in Malaysia, Philippines and Vietnam, other Nordic companies have, Norwegians in particular. For instance Aker is currently investing in Malaysia, and Norway also participates in training seafarers in the Philippines.

The Russian Far East is also an increasingly important arena of maritime activities as the offshore oil and gas production increases and as the Northeast Passage is attracting international interest. The Russian Government aims at quintupling the Russian shipbuilding output by 2030 with the total state funding of RUB 1,3 trillion, and the new Far Eastern shipyard complex seems to be the future priority for the state due to the required shipping capacities in the area. Although the Finnish maritime companies have mostly been cooperating with companies located in St. Petersburg or Moscow, the actual outcomes might be often used in the Far Eastern or Arctic waters. Currently Finnish and Russian shipbuilding companies cooperate through shared shipbuilding processes, Finnish companies focusing on design and Russian companies on building hulls, and thus complement each other like in the case of Arctech Helsinki shipyard. Plenty of Finnish companies have also been involved in the Russian maritime business, such as Aker Arctic, Evac, Justuxia, Kemppe, Mareco Marine Systems, Marloff, Rolls-Royce, Steerprop and Wärtsilä.

While the Far East today is a global center of maritime activities, the presence of Finnish companies there is of

increasing importance. It can be noted that although the Finnish maritime cluster possesses various kinds of expertise, only a group of large, international companies are active in this region, although the emerging maritime clusters in the Far East would provide market opportunities also for other Finnish businesses with cutting edge niche expertise.

The business opportunities and challenges in the Far East

The Finnish maritime businesses have special expertise particularly in cleantech solutions, design and engineering services, ship repair and conversion services, offshore and Arctic solutions, for which there is growing global demand. Interest in the Arctic knowhow is growing particularly in China, Japan, Russia and South Korea which creates business opportunities for Finnish companies specialized in this field. Finnish companies have potential to become forerunners in various green technologies and solutions in both shipping and shipbuilding, for which there is demand for instance in Singapore and South Korea. Particularly Singapore is interested in European design and solutions, and in the future the country will provide increasing business opportunities for international companies specialized in LNG, port construction, and green shipping, for instance. In addition, Chinese and Russian markets offer opportunities for design and engineering companies as well as other suppliers of the maritime industry as there is great demand for foreign technologies and expertise in shipbuilding in those countries. The smaller maritime players in South East Asia, i.e. Indonesia, Malaysia, Philippines and Vietnam, offer cooperation possibilities for Finnish actors for instance related to the development of energy saving technologies and environmental solutions, maritime safety, and maritime training and education.

However, in the growing markets there are also more and more competing actors and the constantly increasing global competition creates challenges for the European maritime clusters. Although knowhow in various niche technologies forms the current competitive advantage of the Finnish maritime cluster, there are also other companies providing state-of-the-art expertise in the same fields. For instance, although the offshore markets are extensive, several countries worldwide plan to focus on the related activities and expertise, and there is eventually room only for the best of the best. It seems that the future competitiveness of Finnish companies lies in highly specific niches and they can only respond to global competition by maintaining their position in the forefront of the global innovation development with highly active marketing operations and cooperation with customers.

In fact, it has been concluded in various contexts that although Finnish companies are highly advanced in innovation activities, there is room for improvement when it comes to marketing and selling these innovations and expertise. Companies need to be present in new markets already at the emerging phase and build customer relationships and business networks – later it might be too late, if competitors have already managed to establish relationships with the key actors.

However, building presence in emerging markets is resource consuming and requires patience, thus being challenging for Finnish SMEs. Internationalization requires intensive networking, both within and outside the home cluster, so that the companies can pool their resources and benefit from each other's contacts and experiences. When operating in the Far East, getting into new projects requires existing

contacts, international reputation, or at least high-level references. This forces SMEs to form groups of companies that can together participate in project biddings. Having employees with skills in local language would also be highly helpful in establishing new business relationships. Such knowledge pipelines can help foreign companies in learning how to deal with local regulations and authorities, for instance.

When taking into account the resources needed for such activities, it is no wonder why Finnish domestically operating SMEs tend to find it overly challenging to enter the booming Far Eastern markets – particularly when the home market also provides new challenges to tackle, such as the sulphur directive and increasing cost levels. However, while the home market requires developing new technological solutions, the same solutions could be sold to the world, the sales again providing further resources for R&D. Consequently, the Finnish maritime sector experiencing a structural change is in need of active networking at a global scale. In fact, as the whole maritime business today is global, it is hard to define such thing as home market.

In addition, while the Far Eastern maritime sector provides considerable market opportunities for Finnish businesses, it is clearly worth noting that those competing clusters have also been smarter in some dimensions of developing the sector, for instance by establishing international investment hubs. Consequently, the maritime clusters not only in Finland but in the whole Europe should closely follow the market developments as well as technological, infrastructural and business-related advancements in other parts of the world – the Far East currently providing the most interesting example.

Eini Laaksonen

Project Researcher

Hanna Mäkinen

Project Researcher

Pan-European Institute

Turku School of Economics

University of Turku

Finland



The authors are highly grateful for the financial support of Werner Hacklin Foundation and the EU Interreg IV A Programme. For further information on the topic, please visit www.cb-smartcomp.eu and see SmartComp Research Report No 3.

SMARTCOMP

SMART COMPETITIVENESS FOR THE CENTRAL BALTIC REGION



CENTRAL BALTIC
INTERREG IV A
PROGRAMME
2007–2013



EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND
INVESTING IN YOUR FUTURE

To receive a free copy, please register at www.utu.fi/pei



MINISTRY FOR FOREIGN
AFFAIRS OF FINLAND

Baltic  Development Forum
sustainable growth · innovation · competitiveness



JOHN NURMISEN SÄÄTIÖ
JOHN NURMINEN FOUNDATION



This BRE Special Issue is part of the SmartComp project which is partly financed by the Central Baltic INTERREG IV A Programme 2007–2013. This publication reflects the authors' views and the Managing Authority of Central Baltic INTERREG IV A programme 2007–2013 cannot be held liable for the information published by the project partners.

ISSN 1459-9759

Editors: Akseli Jouttenus, Eini Laaksonen and Hanna Mäkinen

University of Turku
Turku School of Economics, Pan-European Institute
Rehtorinpellonkatu 3, FI-20500 Turku, Finland
Tel. +358 2 333 9567, www.utu.fi/pei



Turun yliopisto
University of Turku

Turun kauppakorkeakoulu • Turku School of Economics